

DEPARTMENT OF THE INTERIOR

ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEYS
BRANCH

1920 - 21

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OTTAWA

F. A. ACLAND

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1921

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Map showing progress of surveys to March 31, 1921.

REPORT

OF THE

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PART I—FIELD WORK

The amount appropriated by Parliament for the survey of Dominion lands was \$700,000.

Forty-five survey parties were engaged in field work, being three less than the number employed during the previous season. Of this number, ten were employed in Manitoba, eleven in Saskatchewan, fifteen in Alberta, three in the railway belt of British Columbia and six worked partly in one province and partly in another.

The survey of governing lines, which had been sufficiently advanced beyond settlement to permit of the work being suspended during the past two seasons, was resumed in order to provide control for surveys of mineral claims and other scattered surveys in northern Manitoba. One party, however, was sufficient to perform the surveys required.

The acute demand for lands which has resulted from the co-operative efforts of the Soldier Settlement Board and this department to assist intending settlers and soldier settlers in particular in selecting suitable lands for homesteads, necessitated the employment of nine parties on subdivision in Manitoba, Saskatchewan and Alberta as compared with eight last year. Three parties also were required for subdivision work in the railway belt and one party was engaged exclusively on settlement surveys along the Churchill river in northern Saskatchewan.

With the object of rendering more land available for immediate settlement, several surveyors were employed for a short period in the spring, on the work of clearing lands by controlled fires in Porcupine forest reserve and the Peace River district; this method had been tried the previous spring on a small scale and proved to be entirely satisfactory.

The investigation and location of suitable lands for the purpose of directing settlement to areas that will ensure success to the prospective homesteader was continued, four parties being again employed on these surveys.

During the previous season four parties were employed investigating and collecting information for mapping purposes, to supplement that already in the possession of the department, for the purpose of revising the sectional maps issued by this branch and transforming them into topographical maps. Five parties were engaged on the continuation of this work.

BASE LINE SURVEYS

The survey of base lines and meridians, usually a feature of the yearly survey programme, has for the past two seasons been temporarily suspended due to the fact that the progress of settlement has not warranted sufficient new subdivision and other surveys to necessitate the further extension of these governing lines. Surveys of this nature were resumed, however, this year, but a single party was sufficient to complete the work required.

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Party No. 1—Surveys North of The Pas, Manitoba

Renewed activity in the mineral district between Amisk and Wekusko lakes, as

PERSONNEL:

B. W. Waugh, D.L.S., in charge.

Assistants—

K. F. McCusker, D.L.S.
K. S. Raynard.

Leveller—

A. I. Ponton.

Party—

Seventeen employees.

a result of which many small surveys had been made and requests for scattered subdivision surveys received, rendered it imperative that proper control be provided for these and any other surveys which may be required in the district. The work of establishing governing lines in the vicinity was assigned to this party. The eighteenth base line was produced from the Second meridian westerly across two, and easterly across fourteen ranges, and eleven miles of the boundary between Manitoba and Saskatchewan were surveyed.

The establishment of these lines included an exploration of the country for twelve miles on both sides of the lines. In the exploratory work a slight change was made from the usual method employed on base line surveys. Information more accurate and of greater value for mapping purposes was obtained by the introduction of a system of pacing and range-finder traverse, the pacing to measure distances on land and an artillery range-finder with a base of one metre, in conjunction with a prismatic compass, to ascertain the shore-lines of lakes.

Operations in the field were begun on May 31 and closed on October 2, and in addition to the survey of 103 miles of line, 96 miles of levels were run and 624 miles of traverse were completed. Observations for magnetic declination were taken at frequent intervals.

SUBDIVISION SURVEYS

The townships subdivided in Manitoba, Saskatchewan and Alberta were selected in areas close to existing settlement and near to lines of transportation. Surveys in any township were confined to lands which were suitable for settlement, the survey of swamps and muskegs being postponed until such time as they are rendered suitable by drainage. The recent impetus given to settlement is still manifest in the large number of quarter-sections being disposed of and in the number of squatters found in occupation of lands at the time of survey.

In addition to laying out and marking the section boundaries, efforts were made by the survey parties to assist intending settlers by obtaining all available information concerning the purposes for which the lands surveyed were best fitted, the nature and extent of forest cover, climatic conditions in the district, and any other information which would aid development.

Besides the regular subdivision work, all the parties employed, with one exception, were equipped to obtain levelling information in the townships in which they operated.

Party No. 1—Surveys along the Hudson Bay Railway

This party was organized at The Pas, Man., and its work consisted of the sub-

PERSONNEL:

A. E. Glover, D.L.S., in charge.

Assistant—

G. S. Bayly, D.L.S.

Party—

Ten employees.

division of lands for a mile or two on either side of a portion of the Hudson Bay railway. Field operations were begun on May 20 in tp. 73-1-Pr., and were extended northeasterly along the railway to tp. 77-3-E., comprising the subdivision of 78,370 acres in nine townships. This work occupied the time of the party until November 17. It was then

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possible to reduce the number of employees by seven and still have a sufficient number to complete the work of traversing the lakes affecting subdivision in these townships. Most of the lakes presented difficulties for summer traversing which could be more easily overcome after the ice had formed. The traverse was completed and survey operations closed on December 2.

Party No. 2—Surveys in Riding Mountain Forest Reserve

From June 1 to June 11 this party was engaged in the vicinity of Kinistino, Sask., in establishing corners in connection with

PERSONNEL:

G. H. Blanchet, D.L.S., in charge.

Assistant—

A. Fawcett, D.L.S.

Leveller—

Geo. Ross.

Party—

Eleven employees.

the construction of drainage ditches by the Reclamation Service of this department. The next work undertaken consisted of retracement surveys in the neighbourhood of Warman, Sask. Five days were necessary to complete these surveys.

The party then moved to Riding Mountain forest reserve, where the greater and most important part of the season's work was located. This consisted of the subdivision for the Soldier Settlement Board of a major portion of a group of four townships which, after investigation as to their suitability for settlement, had been withdrawn from the forest reserve. In connection with the subdivision work one hundred and sixty miles of levels were run.

In addition to the regular survey work, information regarding the value of different sections of this area for farming purposes was secured by the party. Close observation was made of climatic conditions, and the various kinds of soils occurring throughout these townships were classified from the results of the analysis of soil samples taken from different parts of the area.

The season's operations were concluded on November 30.

Party No. 3—Surveys North of Prince Albert, Saskatchewan

The complete subdivision of one township and the partial subdivision of seven others constituted the work of this party.

PERSONNEL:

J. Hardouin, D.L.S., in charge.

Assistants—

G. W. Bannister, D.L.S.
A. O. Gammon.

Leveller—

G. Palsen.

Party—

Ten employees.

These surveys were necessary as a result of the impetus given to settlement north of Prince Albert by the construction of a railway into the Paddockwood district.

The party was organized at Prince Albert and the location of the first survey camp was reached by trail via Paddockwood. Fire and high water had destroyed the bridges over two creeks on the route followed and these had to be reconstructed before the party could proceed. A considerable portion of the lands selected for subdivision is included in timber berths which have been cancelled. No land was surveyed which was considered unsuitable for settlement.

From the commencement of operations in the field on May 13 until their close on November 15 two hundred and five miles of line were surveyed, sixty miles of traverse completed, and two hundred and forty-four miles of levels run. A total area of 61,510 acres was subdivided.

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Party No. 4—Surveys Southeast of Spirit River, Alberta

The townships in which subdivision surveys were made by this party are located along or close to the Sixth meridian at no great distance from the towns of Spirit River and Grande Prairie. Due to bad roads, some difficulty was experienced by the party in reaching the work. Survey operations were begun on June 2 and continued until November 6, when the party was finally disbanded.

PERSONNEL:
 N. C. Stewart, D.L.S., in charge
 Assistant—
 Jas. Gibbon, D.L.S.
 Leveller—
 E. B. Purdy.
 Party—
 Twelve employees.

One whole township was subdivided and new surveys were made or subdivision completed in four other townships. The work of the party also included the location for the benefit of settlers in the Bad Heart district of a road to the railway through the proposed Birch Hills forest reserve. This necessitated the survey of two miles of road diversions; the main work consisted of the survey of one hundred and fifty miles of section lines and four miles of traverse. In connection with the subdivision work, which covered 48,260 acres, one hundred and forty-six miles of levels were run.

Parties Nos. 5 and 6—Surveys Northwest of Grande Prairie, Alberta

These two parties were organized at Edmonton and Grande Prairie for the purpose of subdividing land suitable for settlement in several townships adjoining the boundary between Alberta and British Columbia north and south of the nineteenth base line. Transportation to the location of the survey work was attended with difficulties both by rail and trail, the result of heavy snowfalls during the winter and a late and rainy spring. These conditions were also responsible for a late start on actual survey operations. The party working in the southerly townships commenced its surveys on June 3 and the other party on June 22.

PERSONNEL:
 W. H. Norrish, D.L.S., and
 R. H. Knight, D.L.S., in charge
 Assistant—
 R. P. Burchnall, D.L.S.
 Levellers—
 D. S. Glenn.
 A. H. Melville.
 Parties—
 Twenty-five employees.

Before undertaking subdivision it was necessary to produce the nineteenth base line westerly across ranges 13 and 14 to the boundary between Alberta and British Columbia. The two parties completely subdivided three townships and partially surveyed ten others, covering in all 117,250 acres. Three hundred and fifty-six miles of levels were also run. Some excellent agricultural land in one township was under lease as a sheep ranch which prevented its being subdivided.

Several days were lost on account of inclement weather; operations were closed towards the end of October.

Party No. 7—Travelling Party in the Peace River District

To this party was assigned the work of subdividing scattered areas of land which lay in single townships or partly in one township and partly in an adjacent township, but which were too far distant from the locations of other parties working in this district to permit of their survey being economically done by any of these parties. It was known, however, that most of this land was suitable for immediate settlement and on this account early subdivision was advisable.

PERSONNEL:
 H. E. Pearson, D.L.S., in charge
 Assistant—
 J. Russell, D.L.S.
 Leveller—
 J. F. M. Muir.
 Party—
 Thirteen employees.

Travelling north from Spirit River the party

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reached its first work and operations were begun on May 24 near the town of Vanreana. Half a township was subdivided after which the party moved farther north and surveyed a portion of a township which lay outside the proposed Clear Hills forest reserve. Proceeding northwesterly to the Clear Prairie district the greater part of one township was surveyed.

Almost a month was required to move to the location of the next work which lay north of Grouard and on September 29 the subdivision of the lands suitable for settlement in two townships was begun.

Field work was completed on November 14 and the party disbanded.

The scattered nature of the work performed by this party, necessitating as it did frequent moves over long distances, resulted in the loss of much time which under usual conditions would have been devoted to actual survey work. Added to this the party experienced all the difficulties of transportation, the result of the flooded condition of the country, encountered by the other survey parties operating in the Peace River district this season.

As a result of the season's operations 64,900 acres of land were made available for settlement. In connection with the subdivision work, levels were run over one hundred and ninety-eight miles of line.

Party No. 8—Surveys near Fort Vermilion, Alberta

From Edmonton, where organization took place, this party proceeded by rail to

PERSONNEL:

<p>Peace River and thence by boat to Fort Vermilion.</p> <p>Work was begun in a township to the south of Fort Vermilion on June 5, the northerly two-thirds being subdivided. From here the party moved north of the settlement and completed the subdivision of the northerly third of two adjacent townships and of nearly the whole of an adjoining township. In all one hundred and ninety-five miles of line were run and in addition twenty-one miles of traverse</p>	<p>Twelve employees.</p>
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were completed. The necessary levelling, covering one hundred and ninety-five miles of line, was done and forty observations for magnetic declination were taken. A total area of 58,400 acres was surveyed by the party.

A fairly satisfactory survey season was concluded on November 4 and on the following day, after joining another survey party working in the same district, a start was made by the overland route on the long journey back to Peace River. Here the party was disbanded on November 22.

Party No. 9—Surveys East of Fort Vermilion, Alberta

The townships in which subdivision surveys were carried on by this party are situated along Peace river in ranges 7 and 8, west of the Fifth meridian.

PERSONNEL:

<p>The party was organized at Edmonton and proceeded via Peace River to the work. Advantage was taken of the use of a scow to transport some of the party from Peace River to the location of the surveys, the regular steamer plying the river being also patronized. Partial subdivision was made in four townships involving the survey of one hundred and eighty-one miles of</p>	<p>C. P. Hotchkiss, D.L.S., in charge.</p> <p>Assistant— C. B. Donnelly, D.L.S.</p> <p>Leveller— H. Carmichael.</p> <p>Party— Twelve employees.</p>
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section line and forty-four miles of traverse. One hundred and ninety-three observations for magnetic declination were taken during the season and one hundred and sixty-three miles of levels were run.

Operations extended from May 20 to October 30 during which thirteen days were lost on account of rain. An area of 54,350 acres was surveyed during the season.

The return journey to Peace River via Keg River and Notikewin settlements was made in company with another party which had been engaged on subdivision work near Fort Vermilion. The long overland trip was completed on November 22 and the party paid off.

RAILWAY BELT SURVEYS

Owing to the rocky and mountainous nature of the country within the railway belt of British Columbia subdivision cannot, as a rule, be extended over full townships. Only those portions of townships which have actually been applied for or which are likely to be required for settlement in the near future are selected for survey.

The policy of disposing of lands by legal subdivisions has been adopted by this department in districts where land is very valuable and an area in one township was surveyed this season into half legal subdivisions for soldier settlement purposes. The definition of the boundaries of these small parcels involves the running of the interior boundaries of quarter-sections and legal subdivisions and also the retracement of old surveys for the purpose of establishing legal subdivision corners where this has not been done in the original survey.

The necessary surveys in the belt were made by two parties working throughout the whole season and one party which was engaged on miscellaneous surveys for short periods amounting in all to about one month.

Party No. 1—Surveys in New Westminster and Ashcroft Districts

On March 11 this party commenced the subdivision into half legal subdivisions

PERSONNEL:

J. A. Calder, D.L.S., in charge

Assistants—

C. B. Donnelly, D.L.S.
(part time).

G. S. Walker.

Party—

Seven employees.

of five quarter-sections in township 2, west of the Coast meridian. This work, which included the survey of the right of way for a logging railway through the subdivision, was urgently required by the Soldier Settlement Board and upon its completion the party was disbanded until May 21 when the regular season's work was entered upon.

Further surveys in the interest of soldier settlers, including the necessary traverse, were completed in township 16, east of the Coast meridian after which the party moved to Agassiz and began the investigation and traverse of a number of islands situated in Fraser river in that vicinity. Excessive rains and high water in the river hampered operations on this work. A portion of the north limit of the railway belt between Harrison lake and Chehalis river was next defined. The party then undertook subdivision surveys entailing the running of four miles of line and some traverse in the Nahatlatch valley. It was next engaged upon subdivision northeast of Ashcroft and the investigation of a mill site at the mouth of Nahatlatch river. The season's work was concluded with the traverse of a portion of Cornwall creek in tp. 20-25-6.

Operations were closed on September 30.

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Party No. 2—Miscellaneous Surveys in New Westminster District

This party was not continuously employed throughout the season but was employed for short periods only on surveys that were urgently required, or which could not be economically executed by the regular party operating in the district.

PERSONNEL:

W. J. Johnston, D.L.S., in charge.

Assistant—

Jas. Gibbon, D.L.S.
(part time).

Party—

Seven employees.

The first work consisted of the subdivision into twenty-acre parcels of portions of two sections in township 2, west of the Coast meridian. This survey occupied the time of the party from March 9 to April 3 and was performed in co-operation with

another party working in adjacent sections in this township. The subdivision was urgent in order to permit of the occupation of the land by soldier settlers in time to commence cultivation. The two parties also co-operated on the survey of the right of way for a logging railway through the subdivision. On the completion of these surveys the party was disbanded.

Later in the season an investigation was made, at the request of the Soldier Settlement Board, of lands selected for subdivision in township 19, east of the Coast meridian and a few days were spent on the survey of lots for summer residence in tp. 5-7-7.

Party No. 3—Surveys in Kamloops District

The work of this party consisted of miscellaneous subdivision, retracement, outline and traverse surveys in several townships between ranges 8 and 20, west of the Sixth meridian.

PERSONNEL:

J. Vicars, D.L.S., in charge.

Assistant—

E. S. Fry.

Party—

Seven employees.

The fact that most of the lines surveyed lay on rough and heavily-timbered mountain-sides and the scattered nature of the work, necessitating the moving of camp at frequent intervals, rendered rapid progress impossible.

In connection with the subdivision, outline and retracement surveys, forty-eight miles of line were surveyed which included the delimitation of a portion of the south boundary of the railway belt through three ranges southeast of Kamloops. Traverse surveys, which included the stadia traverse of six small lakes and of portions of the shore of Shuswap lake, covered eleven miles. An extra mile of traverse was required to locate settlers' improvements.

Operations in the field extended from April 25 to October 22 when on account of inclement weather the party was disbanded.

STADIA SURVEYS

Of eleven parties engaged on stadia traverse ten were employed on the work of determining the present area and permanency of all bodies of water in townships which were surveyed years ago and the plans of which are being revised as this work progresses. In addition to the examination of water areas the condition of the monuments in the townships was noted, small surveys were completed and the necessity of resurveys of whole or partial townships reported upon. Where it was possible to do so without interfering with the progress of the stadia work, information was collected regarding buildings, roads, pack-trails, railways, and telegraph and telephone lines in the areas covered. This information will be used in the compilation of sectional maps. As these parties worked in settled districts motor cars were very generally used for transportation purposes.

Stadia surveys were also conducted by one party in northern Manitoba where investigations in the district north of Thicket Portage, on the Hudson Bay railway,

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indicate the probable occurrence of minerals of promising value from a mining standpoint. The main object of the work was the establishment of survey monuments at frequent intervals to serve as reference points for tying in geological surveys, surveys of mining claims or other lots and all future surveys but the work was also of an exploratory nature. Transportation was carried on by means of canoes.

Party No. 1—Surveys in Northern Manitoba

Beginning at a point where the eighteenth base line intersects the east shore of

PERSONNEL:

E. P. Bowman, D.L.S., in charge

Assistant—

B. H. Segré, D.L.S.

Party—

Four employees.

Setting lake a line of control by stadia traverse was established following the principal lakes and connecting streams northeasterly to the east boundary of tp. 84-11-E.

The main traverse extended along the east shore of Setting lake, down Grass river, along the north and east shores of Paint lake, through Upper Oswagan and Oswagan lakes and thence down

Burntwood river to Split lake. It was continued along the north shore of Split lake and down Nelson river, where a tie was made to the east boundary of tp. 84-11-E. Returning to the head of Clark lake the traverse was carried southwesterly along the south shore of Split lake through Witchai lake, up Grass river, through Teal, Bald Eagle, Natawahunan and Partridge Crop lakes to the twentieth base line. A short section of Partridge Crop lake was omitted but commencing at the northeast corner of section 24, tp. 76-1-Pr., the traverse was carried through the remaining portion of Partridge Crop lake and the intervening streams and lakes, which included Wintering lake, to a station previously located on Paint lake. In addition to this main circuit the line was extended up Burntwood river from its junction with Manasan river forty miles to a point about two miles above Wuskwatim lake. Ties were made to the eighteenth, nineteenth, twentieth and twenty-first base lines, short traverses from the main circuit being necessary in some cases to effect these and other required ties to monuments on township boundaries.

Along the traversed route, monuments consisting of a short iron or wooden post referenced by a stone cairn were erected at intervals of from four to six miles. An attempt was made in the early part of the season to make an accurate traverse of one shore of the lakes encountered but it was realized that this could not be carried out and the proposed circuit completed during the season. The method then adopted was to obtain as much detail as possible by means of a range-finder although the detail in bays often had to be neglected.

Much information bearing on the natural resources of the district was collected and this was supplemented by numerous photographs depicting the general nature of the country, the forest cover, power sites, points on transportation routes, etc.

Surveys were commenced on May 24 and completed on October 18. Progress was delayed to some extent by the many portages encountered along the route.

The mileage traversed comprised seven hundred and twelve miles of shoreline of lakes and islands, four hundred and forty-six miles of river and seven and a half miles of ties and portages. Seventy-five monuments were erected along the route.

Party No. 2—Surveys North of Dauphin, Manitoba

On May 25, stadia surveys were begun by this party along the west shore of lake

PERSONNEL:

G. A. Bennett, D.L.S., in charge.

Party—

Four employees.

Dauphin at the mouth of Valley river and were continued throughout eight townships in that vicinity until July 14. Additional help was then engaged and the subdivision of fractional tps. 36 and 37—19-Pr. was undertaken. Thirty-nine squatters with their families were found in occu-

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pation of the lands in tp. 37-19-Pr. and the location by stadia traverse of the improvements of these settlers was necessary with a view to devising a suitable scheme of settlement survey. An investigation of a portion of tp. 35-19-Pr. lying south of Pine Creek settlement was also made for the same purpose.

Upon the completion of this work stadia surveys and investigations were resumed and extended over thirty-six townships. Operations were closed on November 26.

During the survey season the party completed, in addition to the subdivision of three thousand acres and supplementary work, the traverse of forty-four lakes and three small rivers. Information regarding roads, trails and settlers' improvements in the district covered by the surveys was obtained and carefully noted and sixteen stations were occupied for magnetic observations.

Party No. 3—Surveys East of Dauphin, Manitoba

The bulk of the survey work carried out by this party consisted of stadia traverse and investigation in thirty-three townships in the vicinity of Dauphin and extending easterly to the west shore of lake Manitoba. This included the traverse of a portion of the shore of lake Dauphin and three small tributary rivers and of portions of the shores of Ebb and Flow lake and lake Manitoba. Stadia surveys were also executed in five townships south of Dauphin in the vicinity of Erickson and Angusville and to the north in tps. 29 and 30-15-Pr.

PERSONNEL:

P. J. McGarry, D.L.S., in charge

Assistant—

A. H. King, D.L.S.

Party—

Three employees.

The subdivision of a surrendered portion of Waterhen Indian reserve in townships 34, ranges 15 and 16, west of the Principal meridian, comprising eleven hundred acres, was completed.

The party also accomplished some supplementary work which included the classification of roads for mapping purposes in portions of the district, some necessary retracement surveys and the taking of magnetic observations.

Surveys were commenced on May 28 and concluded on November 27.

Party No. 4—Surveys East of Lake Manitoba

This party was organized at Winnipeg and proceeded to Oak Point, Man. The stadia traverse of the east shore of lake Manitoba was begun July 19 in tp. 18-5-Pr. and continued through five townships. The shore being soft and marshy and covered with a dense growth of reeds and rushes, progress was slow. In all, twenty-two townships in the vicinity of lake Manitoba were investigated, the party working northerly in the direction of lake St. Martin as surveys of an urgent nature were required in that district. These were completed on November 6.

PERSONNEL:

W. A. Fletcher, D.L.S., in charge.

Party—

Four employees.

Heavy rains and snow flurries during the latter part of October rendered conditions unfavourable for survey operations and transportation was hampered by bad roads. It was accordingly decided to reduce the number of employees on the party and with hired transport to proceed with some work specially required in tp. 25-5-Pr. and tp. 14-3-E. This was finished and the remainder of the party disbanded on November 18.

In addition to the work on the investigation of water areas some retracement surveys were carried out in five townships

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Party No. 5—Surveys South of Weyburn, Saskatchewan

The area covered by Souris sectional map, No. 20, comprising townships 1 to 8,

PERSONNEL:

C. Rinfret, D.L.S., in charge.

Assistant—

P. E. Radley.

Party—

Three employees.

ranges 1 to 15, west of the Second meridian, included, with some exceptions, all the townships selected for stadia investigation by this party. Advantage was taken of this to have the party, in conjunction with the stadia work, obtain accurate and reliable information to be used in the revision of this map. The investigation of water areas was begun on May 12 but was interrupted on May 31 to complete the revision work. It was resumed on September 4 and eighteen townships west of the area covered by Souris sheet were investigated. Operations in the field were closed on October 15.

This party completed the traverse of one hundred and sixty-three lakes and the investigation of three hundred and seventy others. Miscellaneous subdivision and retracement surveys necessitated the running of sixteen miles of section line and the establishment of eleven monuments.

Barometric levels were registered at thirty-six hundred points and forty sets of observations for magnetic declination were taken.

Party No. 6—Surveys North of Yorkton, Saskatchewan

The surveys conducted by this party were confined for the most part to a block of

PERSONNEL:

P. M. H. LeBlanc, D.L.S., in charge.

Party—

Four employees.

townships lying north of township 29 and extending westerly from the Second meridian through eight ranges. A few townships west of this group were also included in the work. In a total of fifty-nine townships investigated and reported upon two hundred and forty lakes of various sizes were traversed and Assiniboine and Whitesand rivers were surveyed through fourteen townships. Miscellaneous retracements in four townships necessitated the survey of six miles of section line and the establishment of four monuments. A cemetery site was surveyed in the southeast quarter of section 36, tp. 31-2-2.

Supplementary work consisted of the collection of information as to the condition of the monuments and the necessity for resurveys in the townships in which water areas were investigated, the classification for mapping purposes of roads and trails in the district and the taking of thirty observations for magnetic declination.

Survey operations were begun on May 17 and the party was disbanded on November 17.

Party No. 7—Surveys near Prince Albert, Saskatchewan

The greater part of the area in which stadia surveys and investigations were

PERSONNEL:

Wm. Christie, D.L.S., in charge

Assistant—

J. Carroll, D.L.S.

Party—

Three employees.

conducted by this party lies north of North Saskatchewan river, but a number of fractional townships south of the river were also examined. No investigations were made in those portions of townships included in Pines and Nisbet forest reserves. Field work was started on July 6. Six fractional townships were investigated in which no water areas requiring traversing were found and in all twenty-nine townships and fractions of townships were completely investigated.

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Two hundred and nine lakes and a portion of South Saskatchewan river were traversed and many more water areas, which were not large enough to survey, were examined. Of the lakes traversed one hundred and sixty-two had not been traversed in the original surveys. These ranged in area from about seventy-five acres down to the minimum area requiring stadia survey, five acres. Eleven were fifty acres, or over, in area.

In the course of the work all roads throughout the district were classified. Fifty-five observations for magnetic declination were taken.

On December 16 field operations were closed and the party was disbanded at Prince Albert on the following day.

Party No. 8—Surveys near Battleford, Saskatchewan

The examination and necessary survey of water areas in thirty-six townships together with retracement surveys in one township

PERSONNEL:

C. H. Taggart, D.L.S., in charge

Party—

Four employees.

constituted the greater part of the work of this party. With the exception of two isolated townships in which special investigations were required the area covered lay in the vicinity of Battleford and North Battleford. Some three hundred water areas were examined, three hundred miles of shoreline traversed and approximately seventy-five miles of section and tie lines were surveyed. Battle river was traversed for a distance of thirty-five miles from its confluence with Saskatchewan river; this work occupied the party for seventeen days.

In the townships investigated fourteen hundred miles of roads were examined and classified, and general information useful in the compilation of maps of the district was collected. Observations for magnetic declination were taken in each township.

It was found impossible to keep the party up to strength during the entire season owing to the difficulty in securing suitable assistance and at times progress was to some extent retarded.

Surveys were conducted south of Saskatchewan river from their commencement on June 7 until September 28 and north of the river from this date until operations were closed on November 25.

Party No. 9—Surveys Northeast of Lloydminster, Saskatchewan

An irregular block of townships lying north of township 53 and extending westerly from the Fourth meridian and the west

PERSONNEL:

C. M. Walker, D.L.S., in charge

Assistant—

D. R. Paterson.

Party—

Three employees.

boundary of Kehiwin forest reserve through nine ranges chiefly comprised the area in which this party carried on stadia work. A few isolated townships north of this block were also included. Progress was retarded during the early part of the season partly on account of the necessity of employing inexperienced help due to the scarcity of men familiar with survey work and partly on account of a period of bad weather during which operations had to be temporarily suspended.

Surveys were begun on June 1 in tp. 53-9-4 and extended to the north and east, thirty-seven townships being completely investigated and the necessary traverses made. Investigations were also carried out in portions of several other townships and retracement surveys covering two miles were made in tp. 58-9-4.

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Up to November 13 a full party was engaged on the work and the greater part of it was completed. On this date the services of three members of the party were dispensed with and the surveyor in charge with his assistant completed required surveys in some isolated townships. Operations in the field were closed on November 27.

Party No. 10—Surveys Southeast of Lethbridge, Alberta

The water areas in eighty-one townships in the district south of the towns of Macleod and Lethbridge between the international boundary and the second range west of the Fifth meridian were covered by stadia surveys and investigations conducted by this party. On portions of the work progress was retarded by the hilly nature of the country and for the greater part of the season the party was one man short of the number of employees authorized owing to the difficulty in securing and retaining a suitable man.

Operations were begun on June 4 and continued until November 9, during which period three hundred and thirty-one miles of traverse were completed. This included the traverse of two hundred and four lakes and twenty-five short stretches along Belly, Waterton, and Oldman rivers.

Information for mapping purposes was collected in the eastern portion of the district as well as in nineteen townships previously investigated and in Blood and Peigan Indian reserves.

Party No. 11—Surveys near Edmonton, Alberta

A total of twenty-one townships, in the majority of which water areas were very numerous, were completely investigated by this party. Some work was also done in five other townships and in a portion of St. Albert settlement. Operations were begun on June 18 a few miles northwest of Edmonton, the general location of the area investigated being west of that city. In the northern part of township 54, ranges 27 and 28, several soldier settlers were found, who, owing to there being no trace of the monuments of the original survey on the ground, were unable to locate the boundaries of their homesteads. A form of petition for a resurvey was left for circulation among those whose lands were affected. Special investigations were made in three outlying townships, one to the north and two south of Edmonton. One of these investigations involved the retracement of a mile of section line and the correction of a corner in tp. 49-23-4.

On October 5 the party closed operations in this district; three members were paid off, and the surveyor in charge, accompanied by his assistant, proceeded to Jasper, Alberta, where the subdivision into lots of an addition to this townsite was urgently required. The necessary work involved the survey of fifty-nine lots and the establishment of seventeen lot corners of the old subdivision.

This work and the survey of a one-acre parcel on the opposite side of Athabaska river occupied the time of the party from October 12 until November 3, when operations were finally closed.

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MISCELLANEOUS SURVEYS AND RESURVEYS

Some of the early surveys of base lines and meridians, especially those made under contract prior to 1874, were not very accurately made either in direction or measurement. As these are the lines upon which all other surveys depend, it is very necessary to know how they are on the ground, and for this reason retracements of some portions of such governing lines are necessary. One party was employed on this work.

When the marks of the surveys have disappeared it is difficult for new settlers to locate their lands, and numerous applications for the re-establishment of monuments are yearly received. The policy of the department is to renew the survey lines, provided this can legally be done, after an investigation by an officer of the department has shown that it is impossible to locate the lands without a new survey. Such an investigation of a number of complaints regarding lost and obliterated monuments in a single township sometimes reveals the necessity for a resurvey of the whole or greater part of that township. Provided this condition obtains in a sufficient number of townships in one district to justify the necessary expenditure, a complete survey party, equipped as to number and transport as for original subdivision, is organized and assigned to the work. One such party was employed.

As a general rule, however, resurveys are not confined to single townships or a group of townships but are located at widely separated points and do not require much work to complete them. These include retracements in order to locate and correct errors in the original survey, the re-establishment of lost section and quarter-section corners, the renewal of monuments for important latitude observations and the alteration of small settlement surveys. To effect such surveys the employment of a large party is neither practical nor economical and they are accordingly assigned to a surveyor who, with only one helper, travels from point to point, engages his transport in the locality of his work and secures additional assistance as near as possible to the location of his surveys. Two such travelling parties were required to complete necessary surveys.

Mr. T. H. Dunn, D.L.S., of the Water Power Branch, who was engaged on surveys in connection with the development of water-power sites along the Pinawa channel of Winnipeg river, made closings on monuments of the Dominion lands system and, where necessary, surveyed section lines, made retracements and erected or restored monuments.

Mr. E. W. Hubbell, D.L.S., Chief Inspector of Surveys, supervised the work of mounding and planting standard survey posts in eight townships situated in Keg River prairie, in the lower Peace River valley. These townships were subdivided in 1918 but owing to the prevalence of gravel and large boulders the mounding could not be completed at the time of survey.

A preliminary survey was also made of Keg Prairie settlement.

Party No. 1—Retracement of Block Outlines in Southern Manitoba

Retracement surveys carried out by this party were confined to a portion of the Second meridian and portions of correction lines and a base line adjoining.

PERSONNEL:

R. B. McKay, D.L.S., in charge.

Assistant—

J. T. Fullerton, D.L.S.

Party—

Five employees.

The Second meridian was retraced through townships 11 to 24, inclusive, and all the correction lines between the second and eighth were retraced easterly from the meridian through from two to four ranges. The fourth base line was also retraced easterly from the Second meridian through three ranges.

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The party was organized at Regina on May 17 and commenced survey operations in the vicinity of Wawota, Saskatchewan, a few days later.

One hundred and seventy-two miles of line were retraced and offset ties were measured to four hundred and thirty-eight monuments. At only eighty-five of these monuments were iron bars or iron posts found, the remainder being obliterated, and in some cases completely lost. All measurements were made with a tape graduated in links and checked with one graduated in feet. Forty-one sets of azimuth observations were taken on the surveys.

Since the surveys lay in well settled country and the wages offered for farm labour were much higher than those allowed for survey work, difficulty was experienced in keeping the party up to strength.

Good progress was made, however, until a heavy snowfall and rough weather rendered it advisable to close operations on November 8.

Party No. 2—Resurveys in Manitoba

The greater part of the work of this party consisted of resurveys in isolated townships, but some retracement and correction surveys were also executed.

PERSONNEL:

A. L. Cumming, D.L.S., in charge.

Assistant—

J. H. Patterson, D.L.S.

Leveller—

J. A. Cameron.

Party—

Ten employees.

Operations were begun on June 26 in the district east of Poplarfield and included the complete resurvey of tp. 22-1-Pr. and the retracement of seventeen miles of line in the township to the south.

From there operations were transferred to tp. 24-12-Pr. which lies east of Shergrove. All the portion of the township not included in the Ebb and Flow Indian reserve was resurveyed and the party then moved to Cowan in tp. 35-23-Pr. The resurvey of this township was also completed and on November 26 the party was disbanded.

With the exception of five days in October, when it was necessary to temporarily suspend survey operations on account of heavy snow and rain-storms, favourable weather was experienced throughout the season.

The party completed the survey of two hundred and twenty-seven miles of line and in addition one hundred and thirty-four miles of levels were run.

Parties Nos. 3 and 4—Travelling Parties

The surveys carried out by Mr. Purser lay, with one exception, in the province of Alberta. They consisted for the most part of resurveys, retracements, corrections and investigations at widely separated points.

PERSONNEL:

R. C. Purser, D.L.S.

E. S. Martindale, D.L.S.

Party—

One engineering helper to each party.

Five weeks were spent on surveys in the vicinity of Cadomin, Alberta, in connection with application by the Cadomin Coal Company for a lease of the surface rights of certain additional

lands in that district.

Survey operations were begun on May 29 and completed on September 11. In addition to the regular work six stations were occupied with a Dover dip circle for magnetic dip and total force. Three complete sets of observations were taken at each station.

Mr. Martindale was engaged on surveys of a miscellaneous nature extending over most of the older portions of Manitoba and part of southern Saskatchewan.

Commencing on May 11 operations were conducted throughout the season at twenty-two separate locations and were not completed until January 9. The work included all the different varieties of surveys usually assigned to a party of this kind

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from the erection of mounds to complete surveys previously performed, to the more complicated resurveys involving the establishment of new monuments.

Difficulty was experienced, particularly during the harvest season, in securing local assistance on the survey work.

TOPOGRAPHICAL SURVEYS

Survey work in connection with the revision of sectional maps, which was begun in 1919, was continued. Based on the experience gained during the previous season many improvements in the method of conducting these surveys were introduced; motor cars were used exclusively for transportation purposes. Five parties were employed and, as compared with last year, much greater progress was made, eight complete sheets and a portion of another being revised. The value of the revision work is enhanced by carefully prepared and exhaustive reports on the districts examined which are furnished by the surveyors in charge. These reports cover the topography, soil, agricultural possibilities, roads, transportation, markets, settlement, rural development and natural resources.

One party was employed on further topographical surveys in Bow River and Clearwater forest reserves.

Party No. 1—Revision of the Emerson sectional map and a portion of the Dufferin sectional map, Nos. 23 and 22, respectively

A late spring and heavy rains at frequent intervals during the month of May left the roads in poor condition for travel and survey operations could not be commenced until June 4.

PERSONNEL:

G. H. Herriot, D.L.S., in charge.

Assistant

R. D. Davidson.

Party—

Four employees.

Work was first undertaken in the area covered by the Emerson sectional map. This area comprises townships 1 to 8, ranges 1 to 11, east, and ranges 1 to 4, west of the Principal meridian. The party also completed the revision of the easterly one-third of the Dufferin sheet comprising townships

1 to 8, ranges 5 to 9, west of the Principal meridian.

In all, one hundred and sixty townships were investigated and the necessary information required for mapping the area collected. Fifteen thousand miles were travelled by motor car and several hundred miles on foot. Approximately twelve thousand five hundred barometer readings were taken and reduced, one hundred and twenty miles of levels run and two hundred and twenty miles of streams traversed by the compass and pace method.

Before starting operations in the field the surveyor in charge of the party was engaged for some time collecting information from the Land Titles offices and other provincial sources including the Reclamation Branch of the Department of Public Works, the Manitoba Drainage Commission and the Manitoba Roads Board.

Field operations were closed on October 26.

Party No. 2—Revision of the Brandon sectional map and a portion of the Dufferin sectional map, Nos. 22 and 23, respectively

The area in which surveys were carried out by this party included the westerly two-thirds of the Dufferin sectional map, comprising townships 1 to 8, ranges 10 to 19, west of the Principal meridian, and the whole of the Brandon sheet which comprises townships 9 to 16, ranges 5 to 19, west of the Principal meridian.

PERSONNEL:

P. E. Palmer, D.L.S., in charge.

Assistant

W. P. Daly, D.L.S.

Party—

Four employees.

Before commencing operations in the field some time was spent in collecting available surveys infor-

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mation from the provincial Department of Public Works and other sources at Winnipeg, and from the Land Titles office and the office of the Manitoba Highways Engineers at Brandon.

The revision of the Brandon sheet was begun on May 15 and completed on August 12. Work on the Dufferin sheet occupied the party for the remainder of the season and operations were closed on October 19.

The season's work involved the collection of topographical mapping information covering two hundred townships. Plans of the built-up areas of forty-eight towns and villages were prepared and more than eighteen thousand barometric elevations were taken and reduced. A considerable amount of traverse by pacing and the running of several hundred miles of levels was necessary in connection with the surveys.

Party No. 3—Revision of the Moose Jaw and Regina sectional maps, Nos. 69 and 119, respectively

Moose Jaw sectional map, together with Regina sectional map, which adjoins it to the north, comprises townships 9 to 24 from range 16, inclusive, west of the Second meridian westerly to the Third meridian.

PERSONNEL:

W. J. Boulton, D.L.S., in charge.

Assistants—

E. C. Coursier, D.L.S.
S. C. Akins.

Party—

Three employees.

The party engaged on the investigation of this area was organized at Regina. Ten days were spent in collecting information from the Provincial Government offices at this point and surveys were commenced on May 12. Until June 14 the

work was carried on without the services of a senior assistant and progress was somewhat retarded on this account. Twenty-three days were lost throughout the season on account of inclement weather and bad roads. The investigation of the Missouri Coteau, which occupies the southwesterly portion of the Moose Jaw sheet, presented some difficulties, especially in the rougher parts where roads are comparatively scarce.

In connection with the revision work, which covered two hundred and thirty-four townships, approximately two thousand barometric readings were taken. Some stadia traverse was done by the party in tps. 20-20-2 and 22-27-2.

Operations were closed on October 30.

Party No. 4—Revision of the Rosebud sectional map and a portion of the Calgary sectional map, Nos. 165 and 114, respectively

This party was organized at Calgary and survey operations were begun on May 26. Before commencing field work the information

PERSONNEL:

J. R. Akins, D.L.S., in charge.

Assistant—

F. H. Wrong, D.L.S.

Party—

Four employees.

available at head office was supplemented by much additional information obtained by the surveyor in charge from the Surveys Branch and the Telephone Branch of the Alberta Provincial Government and from the offices of the Director of Leveling and the Commissioner of Irrigation at Calgary.

Attention was first given to the work required on the easterly portion of the Calgary sectional map comprising townships 17 to 24, ranges 1 to 4, west of the Fifth meridian. Work in the foot-hills district was rendered difficult on account of thick growths of willow scrub, and progress was retarded in that portion covered by Sarcee Indian reserve by the lack of surveys within the reserve upon which to base the revision work.

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The surveys in connection with the Calgary sheet were completed on July 9 and the revision of the Rosebud sheet, which comprises townships 25 to 32, ranges 16 to 29, west of the Fourth meridian, was begun on the following day.

In connection with the revision work spirit-levels were run where there did not exist sufficient control, and a rough classification of the soil was made. Some traverse surveys were also made in tps. 29 and 30-21-4 and a small correction survey in tp. 29-21-4.

Field operations were closed on October 19.

*Party No. 5—Revision of the Red Deer and Peace Hills sectional maps,
Nos. 215 and 265, respectively*

Previous to organizing his party at Edmonton the surveyor in charge was occupied for several days in collecting information at the offices of the Director of Surveys and of the Telephone, Highways and Drainage Departments of the Provincial Government, as well as from various other sources, to supplement that already prepared for use on the surveys.

PERSONNEL

J. W. Pierce, D.L.S., in charge.

Assistant—

F. W. Beatty, D.L.S.

Party—

Six employees

On June 15 the field work in connection with the revision of Peace Hills sectional map was begun and the work was continued throughout this and the Red Deer sheet immediately adjacent to the south. This whole area comprises townships 33 to 48 from range 15, inclusive, west of the Fourth meridian, westerly to the Fifth meridian, a total of two hundred and forty townships.

The traverse of the trails through four Indian reserves, which occupy a considerable area between Wetaskiwin and Ponoka, was necessary in order to show the same topographical information as elsewhere. These traverses were effected by the use of the compass and speedometer and were used as a base for further investigation in the area.

Survey operations were closed on November 12.

Party No. 6—Photo-topographical Surveys in Bow River and Clearwater Forest Reserves

The area covered by additional photo-topographical surveys in Bow River and Clearwater forest reserves comprises a portion of the district lying south of James river between it and Red Deer river, all the country between James and Clearwater rivers, and a narrow strip along the north side of the latter river. This territory lies principally in townships 32 to 35, ranges 8 to 11, west of the Fifth meridian, and the total area to be mapped is approximately six hundred square miles. Ninety-six camera stations were occupied.

PERSONNEL

M. P. Bridgland, D.L.S., in charge.

Assistant—

L. E. Harris, D.L.S.

Party—

Six employees

In connection with these surveys a stadia traverse totalling thirty-one miles was carried up James river, through James pass and down Eagle creek, to connect with a station previously established on Red Deer river.

On completion of the work in this district the party moved to tp. 28-14-5 and surveyed an area of between fifty and seventy-five square miles in the vicinity of Bonnet Mt. This work involved the occupation of fifteen camera stations.

The topography of this district is of an extremely rough and rugged nature. Bonnet Mt., the dominating peak in the vicinity, is 10,662 feet above sea-level and other peaks close by range from 9,000 to 10,000 feet.

Survey operations were completed and the party disbanded on September 11.

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LAND CLASSIFICATION SURVEYS

The object of these surveys is to provide intending settlers with accurate and reliable information that will enable them to select lands offering the best inducements for settlement.

Although this work was first undertaken for the purpose of assisting soldier settlers, and they are still given the preference in the selection of desirable homesteads, the beneficial results of these surveys are not restricted to this class alone. The information collected by the survey parties employed on the investigation and classification of lands is made available to the public in the form of maps, plans and reports which are intended to direct settlement to desirable areas, to keep from settlement areas that are not suitable, and to save the land-seeker time and money that might be lost in examining lands not offering a fair chance for successful settlement.

Four parties were employed on these surveys. Two of the districts selected, one lying north of Prince Albert and the other northeast of Edmonton, were investigated in the interest of soldier settlers. An area in the Peace River district, and the district north and east of Lake Manitoba were examined for general settlement.

Party No. 1—Surveys North and East of Lake Manitoba

The work of this party consisted of the investigation and classification of lands in the district lying along the north and east shores of Lake Manitoba including the area surrounding Waterhen lake and river.

PERSONNEL:

C. S. Macdonald, D.L.S., in charge.

Assistants—

J. F. Fredette, D.L.S.
A. M. Perry, D.L.S.

Party

Four employees.

A total of 10,223 quarter-sections were examined. The area as a whole is more suited to stock-raising and dairying than to any other branch of agriculture. Many abandoned homesteads were found, the majority of which would never have been taken up had information such as is made available by

classification surveys been at the disposal of the settlers.

Besides the investigation surveys the roads throughout the district were classified and the condition of existing monuments noted.

Field work was begun on May 21 and completed on October 11.

Party No. 2—Surveys North of Prince Albert, Saskatchewan

With the exception of a few townships in the northeast portion of the block, east of Candle lake, this party examined all the townships from township 50 to township 56 inclusive, easterly from the Third meridian to range 17, west of the Second meridian.

PERSONNEL:

M. D. McCloskey, D.L.S., in charge.

Assistants—

E. F. Gorman, D.L.S.
S. Hunt, D.L.S.

Party

Four employees.

Exclusive of forest reserves and water areas 960,640 acres were investigated. Surveys were extended into adjoining forest reserves and some parcels of land considered more suitable for agricultural purposes were recommended for withdrawal

from reservation. Roads throughout the district were classified and the location of gravel pits noted for the information of the Dominion Highways Commission. Elevations were recorded by means of aneroids where levelled lines or benchmarks could be found to serve as control.

Survey operations were begun on May 27, some delay being occasioned by the scarcity of men suitable for work on the surveys. Favourable progress was made

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during most of the season. In the parts of the district remote from settlement it was necessary to cut trails for moving camp. This frequently required the services of the entire party and the investigation work was somewhat impeded.

Field work was closed on October 11 and the party disbanded.

Party No. 3—Surveys in the St. Paul des Métis District, Alberta

The district examined by this party is located northeast of Edmonton and comprises an irregular area lying north of North Saskatchewan river and the proposed Kehiwin forest reserve from the Fourth meridian westerly to range 17, west of the Fourth meridian.

PERSONNEL

S. L. Evans, D.L.S., in charge.

ASSISTANTS

P. A. Shaver, D.L.S.

E. F. Browne, D.L.S.

Party—

Four employees.

Approximately 1,528,000 acres were included in the investigation surveys which extended over eight-three townships. In addition to all open lands every homesteaded quarter-section in the

area was visited and those which had been abandoned were reported upon. Lands held under grazing leases were also examined. The roads throughout the district were classified and numerous soil samples were taken for purposes of analysis. Information regarding the available water supply, climatic conditions and other data was collected.

Survey operations were begun on May 24 and completed on October 31.

Party No. 4—Surveys East of Grande Prairie, Alberta

The area examined by this party lies principally between Little Smoky and Smoky rivers from township 70 to township 75; some townships west of Smoky river were also included in the investigation.

PERSONNEL

L. Brenot, D.L.S., in charge.

ASSISTANTS

A. O. Gorman, D.L.S.

N. S. Clouston, D.L.S.

Party—

Four employees.

The party was organized at Edmonton. Some difficulty was experienced in securing suitable men for work on the surveys, which, together with the temporary suspension of transportation service over the Edmonton-Dunvegan and British Columbia

railway due to landslides along the Smoky river, was responsible for a delay in the commencement of survey operations. Field work was begun on June 18.

Fifty-three whole and fractional townships comprising 7,392 quarter-sections were examined but on account of many of the quarter-sections being divided into separate parcels by rivers and the boundaries of Indian reserves and timber berths the number actually classified was 7,597. While most of the quarter-sections examined and still available for settlement require extensive improvements many can be economically improved and some are suitable for immediate settlement. A tract of 445 square miles located in the centre of the district might well be reserved for forestry purposes.

Field work was concluded on October 14.

SURVEYS OF SETTLEMENTS AND TOWNSITES

The work required in connection with the survey of settlements and townsites is as a rule limited and is usually executed by parties engaged on regular surveys in the vicinity of the points at which the necessity for settlement surveys arises, or by traveling parties.

A small survey involving the laying out of a few additional lots was made on Matheson island in tp. 32-4-E. and the subdivided portion of the townsite of Jasper, Alberta, was extended by the survey of fifty-nine lots.

At several points in northern Saskatchewan in the area drained by Churchill river, trading companies, their employees, church missions and persons engaged in

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the fur trade have taken up small holdings. At present it is not advisable to extend regular subdivision surveys to these points. A small party was detailed to lay out settlement lots to include the lands applied for and lands which are likely to be required for settlement in the near future. Surveys were made at Ile-à-la-Crosse, Patunak, Bélanger, Stanley and La-Ronge. Canoes were used for transportation and additional labour, when required, was engaged at the points where surveys were being made.

Settlement Surveys in Northern Saskatchewan

This party was organized at Prince Albert and proceeded to Ile-à-la-Crosse settlement, where work was begun on June 11.

PERSONNEL:

S. D. Fawcett, D.L.S., in charge.

Assistant—

C. A. R. Lawrence, D.L.S.

Party—

Two employees.

Although individual squatters have located and built houses at widely separated points along the shores of lac Ile-à-la-Crosse, their parcels were not included in the surveys, which were confined to those points where several settlers were located on a small area and where disputes regarding boundaries were likely to arise. Several lots varying in area from five to ten acres were laid out in the old settlement and in the Canoe River and Beaver River sections.

From here the party moved to Patunak settlement, distant forty miles up the east arm of lac Ile-à-la-Crosse. Small lots were surveyed here for the Roman Catholic Mission and the Revillon Frères Trading Company. A few additional lots were also surveyed to accommodate the representatives of other trading companies who may seek locations at this settlement.

The party left Patunak on August 17 for Bélanger settlement, situated on Churchill river between Snake and Sandy lakes. At this point ten lots were surveyed, which were considered sufficient to supply the demand for some years to come.

On completion of the work at Bélanger the party moved to La-Ronge over a long and tedious route broken by numerous rapids and portages. A parcel of land containing eighty-four acres was surveyed for the Indian Mission and twenty additional lots were required to accommodate the settlers and provide each with a small plot for gardening purposes.

Surveys at La-Ronge were temporarily suspended in order to lay out some lots at Stanley settlement before freeze-up, which occurs at an early date in this district. This settlement is located fifty miles northeasterly from La-Ronge, and the work consisted of the survey of a sufficient number of lots to meet the requirements of the present settlers and the representatives of the trading companies who have posts at this point.

Returning to La-Ronge, surveys were completed and the party left for Prince Albert on October 18.

Much time was consumed in transporting the party between the points at which the surveys were located and in travelling to and from the district. Over six hundred miles were covered by canoe and one hundred and fifty miles on foot. The season's surveys entailed the running of seventy miles of line.

ALBERTA AND BRITISH COLUMBIA BOUNDARY

The topographical division under Mr. Wheeler was organized for field work at

PERSONNEL:

R. W. Cautley, D.L.S., A.L.S.,
Commissioner for Canada and
Alberta.

A. O. Wheeler, D.L.S., B.C.L.S.,
Commissioner for British Col-
umbia.

Banff with the object in view of closing the gap in the survey of the boundary between the point where work was discontinued in 1919, about one mile north of Fortress lake, and the point where it had been discontinued south of Yellowhead pass in 1917.

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Assistants—

D. M. Robertson, D.L.S.
A. J. Campbell, D.L.S.

Parties—

Eighteen employees.

The location of the watershed north of Fortress lake was begun on June 27 and surveys were carried on until September 9, when rain and snow set in and continued almost without intermission until September 20, rendering the further occupation of camera stations impossible. Some exploration work was done by the party while waiting for the weather to clear, but on September 25 preparations were made for returning to Banff. The late melting of the snow in the spring and its early arrival in the fall caused the failure of the division to complete the topographical work as far as Yellowhead pass, as intended. The terminal point of the season's surveys is located a short distance north of Athabaska pass.

Mr. Cautley continued the production of the 120th meridian south from the north boundary of township 73 with the intention of completing its survey to the point where it intersects the summit of the Rocky mountains, an estimated distance of ninety-three miles.

Owing to the fact that very little was known of the country to be traversed, and particularly of the possible sources of gravel supply or of how far it would have to be packed, it was doubtful whether it would be found possible to provide monument material fast enough to keep pace with the progress of the survey. The season's work therefore was restricted to cutting out the line, selecting sites for monuments, and supplying each site with two thousand pounds of gravel required for the construction of the monuments. In addition, a topographical survey of the country for a mile and a half on either side of the meridian was made. The building of the monuments, precise chaining, levelling and general completion of the survey was postponed until the next season.

Owing to the flooded condition of the country, particularly at the crossing of Smoky river, and the interruption of traffic on the Edmonton Dunvegan and British Columbia railway, much time was lost by the party in reaching the location of the work, and progress was also retarded throughout the season by bad weather conditions. Additional difficulties were also presented by the nature of the country in which the surveys were conducted. The greater part of the line ran through heavy windfall, piled four to six feet high, and interwoven with scrub and second growth timber. Wet muskegs, which made transportation difficult, were also encountered.

The preliminary survey of forty-three and a half miles was completed, the southerly extremity of the line being left at the top of a cut-bank six hundred feet high on the northerly side of Wapiti river at chainage 112.55 south from the north boundary of township 66.

Forty-four monument sites were selected and cleared to a distance of twenty feet from wooden hubs marked with the numbers of the monuments to be constructed and also by old-style iron posts driven to the surface of the ground on the exact line of the meridian and at a distance of a few feet from the actual sites of the monuments.

Of the forty-four sites selected the northerly thirty-three were supplied with gravel from Redwillow river; the remaining eleven sites will have to be supplied from Wapiti river when a crossing has been found and a trail cut to it.

Survey operations in the field extended from July 1 to September 30.

MINERAL CLAIMS

Mining activity has continued in the Rice Lake district in southeastern Manitoba and a larger number of mineral claims than in any previous year was surveyed. In northern Manitoba an important find of gold at Copper lake, north of The Pas, has resulted in some surveys in that locality but mining development in the Flindon district has been held up by the lack of a railway through the district.

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The most important new field to be opened up is at Keno Hill in the Mayo district, Yukon Territory, where exceedingly rich deposits of silver have been found. The only surveyor in the territory has been engaged on surveys in this district during the year. The returns of survey of two hundred and twelve mineral claims in all were received in the department.

CLEARING OF LAND BY CONTROLLED FIRES

One of the problems encountered by the Soldier Settlement Board in its task of settling returned men on the land was that of providing a sufficient number of homesteads suitable for immediate settlement. Considerable areas of land of good agricultural quality were available but these were covered with windfall and *brulé*.

Early in the season of 1919 experiments were conducted on a limited scale, under the direction of the surveyors employed by this branch, in the clearing of these lands by controlled fires with a view to determining the feasibility of this method of reclamation in assisting intending settlers.

These experiments were entirely successful and, at the request of the Soldier Settlement Board, several surveyors were detailed, previous to undertaking regular survey work for the past season, to conduct similar operations on a more extensive scale in two selected areas, one being located in the Peace River district and the other in Porcupine forest reserve. In the latter area operations were supervised by Mr. G. J. Lonergan, D.L.S., the work being carried on by two parties under Messrs. A. L. Cumming, D.L.S., and Wm. Christie, D.L.S.; in the Peace River district two parties in charge of Messrs. R. H. Knight, D.L.S. and W. A. Fletcher, D.L.S., operated under the supervision of Mr. F. V. Seibert, D.L.S.

Great care was taken in the preparations for burning. The surveyors were on the ground early but the work of creating fire-guards around the areas to be burned and for the purpose of safeguarding settlers' improvements and adjacent areas of valuable timber was somewhat retarded by a backward spring. Although the preliminary work was completed the weather proved very unfavourable for firing operations in both districts and the results were not as satisfactory as anticipated.

While waiting for favourable weather the parties continued the construction of fire guards in preparation for continuing this work next season. These will prove of great value in the meantime in safeguarding timber areas in the districts in the event of the occurrence of forest fires.

During the remainder of the season Mr. Seibert with one assistant was engaged on the investigation and selection of areas in the Peace River district suitable for clearing by this method.

LEVELLING

The amount of levelling of all classes run during the twelve months ending March 31, 1921, was 2,830 miles. There was an increase in mileage of secondary control, base-line, and subdivision levelling over the corresponding amounts done in the previous year, but no township outline levels were run during the season.

One party was engaged on precise levels throughout the season, four parties were engaged on secondary control levels and one party ran levels along base lines during the original survey.

Nine parties on subdivision surveys ran a total of 1,596 miles of levels along section lines. While only intended to serve the immediate surroundings and to afford a general record of the topography, this class of levels has been so well carried out that the records may be confidently relied upon in all matters which depend on a knowledge of the relative elevations of a local district.

The work of recording all the results in a clear and readily accessible form has been kept up to date and there is no difficulty in quickly obtaining any one of the many hundreds of thousands of elevations already recorded.

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The number of miles of the various classes of levels run during the year and the total at the end of the year are as follows:—

	Season 1920	Total
Precise levels..	205	1,221
Secondary control levels..	871	5,014
Meridian and base-line levels..	96	12,364
Township outline levels..	902
Subdivision levels..	1,596	9,795
Other lines of levels..	399
Total..	2,830	30,696

Party No. 1—Precise Levels along Railways

Precise levels were run by this party along the Canadian Pacific railway from Weyburn easterly to Findlay Crossing, then along the Canadian National railway southeasterly via Hartney and Minto to Hartney Junction and then northwesterly to Brandon; also along the Canadian National railway from Eyebrow to Moose Jaw. The latter is the completion of the line from Lacombe to Moose Jaw commenced last season. Levelling was started at Weyburn on June 1 and completed to Brandon on September 14. The work at Eyebrow was begun on September 20 and finished to Moose Jaw on October 4 which was the end of the field season. The distances levelled were from Weyburn to Brandon—259 miles, and from Eyebrow to Moose Jaw—16 miles, a total of 305 miles.

The usual procedure for precise levelling was followed throughout. On the line from Weyburn to Brandon sixty three permanent bench-marks were established. These are either on the standard concrete piers made for the purpose or on permanent masonry structures. Connection was made to bench-marks of precise level lines—Weyburn to Govenlock, Stephen, Minnesota to Moose Jaw, Brandon to Estevan, and Portage la Prairie to Saskatoon, also to control levels along the east outline of range 13, west of the Second meridian and tertiary levels along the east outline of range 21, west of the Principal meridian. On the line from Eyebrow to Moose Jaw, connection was made to control levels along the sixth base line, tertiary levels along the Third meridian, and to bench-marks of several precise level lines radiating from Moose Jaw.

Party No. 2—Secondary Levels along Base Lines

The first work done by this party was the levelling of the seventh base line across ranges 13 and 14 west of the Second meridian. The sixth base line was then levelled westerly from the east of range 13, to the east of range 6, west of the Third meridian, where the line was turned north through one township to avoid very rough country and then was continued westerly to connect with the levels along the east of range 13, west of the Third meridian.

Field levelling commenced on June 2 and ended on September 28, during which time 190 miles of main levels and 15 miles of connections were run. Ties were made to three precise level lines at Lebret, Bethune and Valeport, and also to three secondary lines of levels, along the Third meridian, the east boundary of range 13 west of the Second meridian, and of the same range west of the Third meridian. Permanent

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bench marks of the usual pattern were planted every third mile, one being placed near township corners and one midway. In addition a bench-mark of a similar pattern but with the top buried one foot below the surface was placed near the end of every second range. The instruments used were a Zeiss level, two precise levelling rods and steel turning pins.

The line was characterized by many deep valleys, coulées and ravines. Qu'Appelle river was crossed three times, Little Arm river twice, and South Saskatchewan river once. The valleys of these rivers at the points of crossing are about 300 feet deep.

Party No. 3—Secondary Levels along Base Lines

This party ran a line of control levels along the east outline of range 13, west of the Third meridian. Levels were run south from the main line of the Canadian Pacific railway in township 16, near Swift Current, to the international boundary. This portion was begun on June 6 and finished on August 6. The party

PERSONNEL:

E. W. Berry, D.L.S., in charge.

Party—

Six employees.

then moved back to the point of commencement and worked north to township 27 near Wiseton, beginning August 13 and ending on September 29. In all 173 miles were levelled; of these 165 were on the main line and the remaining 8 were on connections.

Permanent bench marks of the standard pattern, appearing above the surface of the ground, were placed at intervals of three miles. In addition, similar bench-marks completely buried to a depth of one foot were planted every twelve miles.

Connection was made to precise level lines along the main line of the Canadian Pacific railway and along the line from Assiniboia to Govenlock, to secondary levels along the fifth and seventh base lines, and to tertiary levels along the second base line and section outlines in townships 20, 21 and 22. Connection was also made to monument 472 of the international boundary survey.

From township 9 to the rim of South Saskatchewan valley in township 20 the land is used for grain growing, although generally more broken and hilly than the average land utilized for this purpose on the prairie. The remainder of the country traversed by the line is mainly rough pasture land. The valleys of Frenchman and South Saskatchewan rivers were crossed. Their depths are respectively three hundred and six hundred feet at the crossings of the line.

Party No. 4—Secondary Levels along Base Lines

The fifth base line was levelled from the east of range 13, west of the Third meridian, to the Fifth meridian.

PERSONNEL:

R. H. Montgomery, D.T.S., in charge.

Party—

Six employees.

Field levelling was started on May 31 and ended on September 30 during which time 277 miles of main levels and 26 miles of connections were run. Ties were made to three precise lines of levels, at Swift Current, Mesekum and Vulcan, and to two tertiary lines of levels on the Third and Fourth meridians.

Permanent bench-marks of standard pattern were planted every third mile, one being placed near township corners and one midway. In addition a bench-mark of a similar pattern but with the top buried one foot below the surface, was placed near the end of every second range. The instruments used were a Zeiss level, two precise levelling rods, and steel turning pins.

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Party No. 5—Secondary Levels Along Base Lines

Levelling was commenced on the twelfth base line on May 28. This line was levelled westerly from the Fourth to the Fifth meridian, the latter being reached on August 28.

PERSONNEL:

J. B. Alexander, D.L.S., in charge.

Party—

Six employees.

The party was then moved south to the tenth base line, stopping on the way at Lacombe to re-level nine miles of line which had been levelled the previous year but in which a small error was

suspected. The result confirmed the original levelling. Work started on the tenth base on September 7 and was carried easterly from the Fifth meridian to the east of range 23, where levelling was ended for the season. Levels run during the season totalled 256 miles, made up of 165 miles on the twelfth base, thirty-six miles on the tenth base, and fifty-five miles of connection.

The early part of the season was very wet and transport was difficult on account of flooded roads and unopened road allowances. Many bridges and culverts were washed out during the spring freshets, and the regular routes of communication became impassable. Conditions, however, improved greatly in the latter part of the season.

One deep valley, that of Battle river, crosses the twelfth base four times. The only other valley of great size which was crossed was that of Red Deer river on the tenth base.

The party was disbanded on September 30.

CONTROL OF SURVEYS

A. M. Narraway, D.L.S., Controller of Surveys

On May 24 the Controller of Surveys left Ottawa to commence his field duties, proceeding to Edmonton, where matters pertaining to survey equipment and the organization of survey parties were dealt with.

The inspection of survey parties was begun on June 11 when the controller visited a party engaged on the revision of sectional maps south of Edmonton. Mr. Narraway's subsequent itinerary lay through central Alberta and Saskatchewan and southern Manitoba, and included the inspection of various parties engaged on land classification surveys, levelling, revision of sectional sheets and retracement surveys.

Returning to Edmonton a trip was made into the Peace River country to Fort Vermilion, where two parties were engaged on subdivision surveys. A close study was made of this district generally with regard to its future possibilities and its immediate requirements in so far as surveys were concerned.

The latter part of August was spent in central Alberta and all of September in northern Manitoba, visiting parties in these areas.

In the latter province an extended trip was made to inspect a party engaged on the traverse of a chain of lakes and rivers lying to the north of the Hudson Bay railway, and another party subdividing lands along that railway.

In addition to the general survey business attended to, eighteen parties were visited in the field and the controller returned to Ottawa on October 16 in order to complete the necessary arrangements for the preparation, during the winter, of the surveyors' plans and reports.

Throughout the season Mr. Narraway was assisted in his field duties by Messrs. T. H. Bartley, D.L.S., and T. A. McElhanney, D.L.S., Assistant Controllers of Surveys. The latter was engaged for part of the season on the work of opening up

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forest reserve areas for soldier settlement. A total of thirty-six visits to survey parties was made by Messrs. Bartley and McElhanney, either in company with the Controller of Surveys or individually.

During the winter, in addition to his usual duties, the controller gave considerable attention to improving the methods employed by surveyors in the preparation of their returns of survey with a view to having this work done, as far as possible, in the Ottawa office, where better results can be obtained under uniform and improved methods than by the old arrangement whereby each surveyor prepared his returns at his home.

The compilation of maps and the preparation of reports in connection with land classification surveys were carried out under the supervision of the Controller of Surveys. As the information collected by surveyors employed on this work is intended for the use of prospective settlers, efforts were made to present it in the best possible form to meet the requirements of the public.

Methods of constructing and utilizing relief maps for development purposes were originated by Mr. Narraway's office. Much time was necessary for experiments, but while this work is still in its early stages the maps already available have been of very practical assistance to the Soldier Settlement Board and other government offices.

G. J. Lonergan, D.L.S., Inspector of Surveys

From May 5 until June 21 the inspector was engaged on the supervision of firing operations being conducted by two parties in Porcupine forest reserve.

Previous to beginning inspection work some time was spent in hiring labourers for some of the surveyors who found it difficult to keep their parties up to strength. Subdivision parties working in the Peace River district were first inspected, considerable time in addition to that spent with each party being required to travel from one location to another. Four parties of this kind and a party engaged on the survey of the boundary between the provinces of Alberta and British Columbia were inspected.

On the completion of inspection work in this district an inventory was made of all articles of outfit stored in the government warehouse at Peace River for the purpose of sorting out and disposing of those worn out or unfit for use.

Two parties subdividing lands in the railway belt of British Columbia were next visited, after which the inspector returned to Edmonton. One party engaged on stadia surveys north of this city was inspected.

The remainder of the season was spent in securing suitable quarters for wintering surveyors' horses, notifying the surveyors as to where they should forward their outfits on the completion of the season's surveys, examining all horses to determine their fitness for use during the next season and disposing of those considered unfit for further work. Articles of outfit stored at different points were also examined, worn-out portions were discarded and others of little use were sold. The inspector returned to Ottawa on November 25.

PART II.—OFFICE WORK

The office staff of the Topographical Surveys Branch, which has for some years been divided between the building on the northeast corner of Metcalfe and Slater streets and the Imperial Building on Queen street, has been consolidated and is now located in the Labelle Building, 105 George street.

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The need of new quarters which would accommodate the entire staff has long been felt, as, apart from the resultant inconvenience of being located in separate buildings, the Imperial Building was especially unsuited to the requirements of the office. The efforts of the draftsmen to produce high-class work were considerably hampered by unsatisfactory lighting, and the efficiency of the printing plant, which, with the storage room for paper, was located in the basement, was even more seriously affected. The lack of good daylight, most essential to satisfactory colour printing, and the impossibility of maintaining an even degree of humidity, which so affected the paper as to interfere greatly with the proper registration of colours, nullified to a large extent the efforts of the staff to produce work of high quality.

The building at present occupied by this branch, while by no means an ideal one for office purposes, is a great improvement. It has also the advantage of being of fire-proof construction, thus affording greater protection to the valuable records of the department which are stored in this office.

General reorganization of the work of the branch was begun in conjunction with the consolidation of the staff and is being continued with a view to increased efficiency.

The Survey Records Branch, which has been lately reunited with this one, is also being reorganized. It is proposed to transfer a portion of their duties to the Land Patents Branch of the department, but the greater part will in future be carried on as part of the work of this office.

SUPERVISION OF FIELD WORK AND ACCOUNTS DIVISION

The estimates for the year 1920-21, which were prepared in this division, provided for an appropriation of only \$700,000, whereas the appropriation previous to the war was over one million dollars. Careful study was necessary to allot the reduced appropriation so as to meet all pressing requirements arising from settlement and development in the western provinces. Information was obtained as to the trend of settlement, the discovery of minerals, the development of water-powers, etc., and preparations were made to extend the surveys to offset all danger of claims conflicting and of erroneous locating.

Two hundred and thirty applications for surveys were received and examined during the year. For every case that was found worthy, arrangements were made to have the surveys carried out without delay. One hundred and fifty-one instructions for surveys were drafted and submitted to the Surveyor General and later were issued to the surveyors in the field.

Fifty-nine accounts for expenditure in the field were received, examined and passed for the approval of the Surveyor General. The examination of these accounts involved extensive correspondence with the chiefs of parties. In addition, 550 local accounts for office expenses, supplies, etc., totalling \$21,100, were examined and passed. The greatest possible care is taken when examining these accounts to see that the orders have been issued to the firms quoting lowest prices, that the merchandise received is of good quality and that the prices are fair and just. There were also 208 accounts from the various railway companies amounting to \$16,600 for transportation of our employees over their lines.

Monthly progress estimates were made of the cost of the operations in the field and the office expenses. This enabled the staff to so control operations as to keep well within the appropriation made by Parliament.

Applications for employment as chief of party, assistant, articled pupil and assistant leveller were received and forwarded to the Civil Service Commission to have certificates of employment issued to those who were selected as best qualified for the work.

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During the season three surveyors and their parties met with accidental losses from fire or from the capsizing of canoes and submitted to the department claims for compensation. The claims were carefully examined and recommendations with reference thereto were submitted for the consideration of the minister.

The clerical staff prepared full information as to the appointments, classification, etc., of the staff as required by the Civil Service Commission and reports to the Commissioner of Taxation as to the incomes of the staff both at the head office and in the field. The attendance and leave records were also kept and the pay lists for all temporary employees checked.

In all, 5,520 draft letters and memoranda were prepared in this division.

SURVEYS INFORMATION DIVISION

The duties assigned to this division are, in general, the preparation of plans and sketches for the instruction of the chiefs of survey parties in the field, the dealing with general technical correspondence relating to surveys, the issue of all preliminary township plans, the registering of all survey returns furnished by the surveyors, the purchase, storage and distribution of all office supplies for both the office and field staffs, the distribution of the maps and publications of the branch, the editing of the annual report of the branch and of other special reports, and other miscellaneous technical work.

In connection with the distribution of maps it is noted that since the issue of the sectional maps in the new style giving greater topographical detail there has been a marked increase in the demand for them. Another map for which there has been a large demand is the new map of the Mackenzie and Slave rivers.

On the whole the amount of work turned out was approximately the same as for the previous year.

EXAMINATION OF SURVEY RETURNS DIVISION

The returns of survey of all Dominion lands are examined and all the official plans thereof are prepared in this division. Besides the surveys carried on by this department, this includes the examination of the returns of survey of all mineral claims and timber berths, the plans of provincial roads and railways, and topographical and boundary surveys.

The desirability of having the instructions for surveys prepared by the staff who examine the returns became more generally recognized during the year. Instructions for the survey of townsites and of northern waterways became a part of the work of this division. In co-operation with the Geological Survey who were about to examine and map a tract in the vicinity of Paint lake and Burntwood river in northern Manitoba where control surveys are very far apart, instructions were prepared for a survey party to make a control survey along Grass, Burntwood and Nelson rivers and intermediate lakes. Some 1,100 miles of shoreline were defined and reference monuments erected at suitable intervals for tying in the details of the geological survey of the adjacent country and all other future surveys. This survey was mapped during the winter by means of the Universal protractor and furnished to the Geological Survey as a base for the geological map.

The discovery of oil near Fort Norman, in the Mackenzie district, rendered imperative the proper mapping of this remote district where heretofore geographical positions were only known relatively. Towards the close of the year instructions were being framed for the traverse of northern waterways from the 30th base line where it crosses Slave river northerly, crossing Great Slave lake and continuing down Mackenzie river a total distance of approximately a thousand miles, this traverse to be made with sufficient care for reliable mapping and to be controlled by four longitude stations to be established by wireless telegraphy by the staff of the Dominion Observatory.

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The year closed with the prospect of a much larger part of the instructions being prepared in this division than heretofore.

The preparation of the town-planning scheme and accompanying plans that had to be approved by the Director of Town Planning for Saskatchewan before the plan of subdivision of the townsite of Lens could be submitted for registration, took considerable time. The scheme is a very comprehensive set of building restrictions, governing the uses to which certain areas may be put, the height and distance apart of buildings, the construction of roads and walks and generally all matters that require to be foreseen in the growth of a city. The town of Lens is intended to be the trading centre and shipping point for soldier settlers who have taken up a large tract of land some miles to the south in what was formerly a portion of Porcupine forest reserve.

In connection with making available to the public, through the Soldier Settlement Board and Dominion land offices, the information collected on land classification surveys, a large part of the staff was engaged for several months in the preparation of plans of the townships examined. This work was carried on from the beginning of the year in order to make the information collected available to intending settlers as quickly as possible. The plans for some 200 townships were prepared.

The returns of survey of the British Columbia-Alberta boundary along the 120th meridian from township 73 to a point in township 66, range 14, and from a point about one mile north of Fortress lake, in township 40-27-5, to township 43-3-6, consisting of reports, maps and field notes, were examined. The survey along the 120th meridian was incomplete, the monuments not having been erected. These will be constructed at a later date.

At the request of the British Columbia Lands Branch, a revision of the regulations for the survey of Dominion lands in the railway belt of British Columbia was prepared. Information was also supplied to the Surveyor General of British Columbia for the adjustment of provincial surveys along the Columbia river north of Revelstoke.

Owing to continued activity in the mining districts of Manitoba and Saskatchewan the surveys of two hundred and twelve mineral claims were received for examination, as compared with ninety-two for the preceding year. Many of the plans of these mineral claims were in triplicate. In the Yukon some rich finds of silver ore were located and as a result eleven mineral claims were received and two group lots surveyed and the returns examined.

Plans of roads to the number of 763, totalling 1,526 miles, were received from the Provincial Governments of Manitoba, Saskatchewan and Alberta and were examined. These plans were submitted by the provinces under the provisions of chapters 99 and 100, R.S.C., 1906. This was an increase over the three preceding years. Railway plans covering rights of way exceeding 800 miles were examined for approval. In some cases more than one copy of the plan was submitted; the gross mileage was 2,167.

During the year 294 township plans, 14 plans of miscellaneous surveys such as settlements, townsites, etc., and 10 special plans were prepared for the draftsmen. This involved among other returns, the examination of 114 books of stadia field notes and 517 stadia plots.

The preparation of special plans of quarter-sections for the Land Patents Branch was an increasing part of the work. It may not be feasible to issue a new township plan when it is desired to grant a patent for some particular quarter-section, but a plan of the particular quarter-section is compiled, sufficient copies being made by hand in the Drafting Division for attaching to the patent sent to the Registrar of the Land Titles Office, and to the copy of the patent registered in the department, as well as for those offices where the plans are necessary for reference.

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From other branches of the department and from the public 1,067 requests for information concerning surveys were dealt with. In this connection 965 sketches were prepared and 2,012 areas for parcels of land were calculated and furnished. Progress report sketches numbering 636 were received from the surveyors in the field and examined.

DRAFTING AND PRINTING DIVISION

In other divisions of the branch plans are compiled from returns of survey. The Drafting and Printing Division prepares these for reproduction by carefully drawing them again so as to make neat, clear copies. From these copies, by means of photography, a zinc plate is prepared which the lithographer uses to print editions of the plans. The preparation of these copies constitutes the main work of the division, but other work closely related thereto is also undertaken as the staff is qualified and equipped for such work. The staff consists of draftsmen, stampers and printers. The draftsmen do the drawing, the stampers put on the lettering by means of type and the printers set up the foot-notes, titles, etc., for pasting on the plans.

Township Plans.—The preparation of township plans for printing still constitutes the most important item of work. As the staff has been engaged on this for many years the work has become standardized and township plans are made with greater facility as compared with miscellaneous jobs. The total number of township plans prepared was 658 of which 364 were reprints of plans formerly in colours the editions of which had become exhausted.

Miscellaneous Plans of Survey.—These include plans of settlements, subdivisions, townsites, group lots, and, generally speaking, any plans of survey other than township plans from which title to lands may be obtained. They also include plans of a section or parts of a section, to be used for issue of patents urgently required, when for some reason the complete township plan is not available. The total number of miscellaneous plans prepared was 201.

Mounting Plans and Maps.—Much of this work is done to accommodate surveyors going into the field. They require maps and plans of the districts covered by their surveys. As these are subject to hard usage in all kinds of weather they are generally mounted on cotton, and frequently dissected and folded to fit the pocket. In many cases several maps have to be fitted together to cover an area of which a map is required. Maps to the number of 282 were mounted.

Topographical Maps.—The drafting of such maps requires the services of men of the very highest skill. Much new work was required on the new-style sectional maps and several of the best draftsmen in this division were assigned to aid in preparing copy for reproduction. Four men are now working on them. No sharp, clear division can be made between the work of this division and that of the mapping division proper, but generally speaking this division does the drawing of all line work for roads, telegraph lines, section lines, etc., and the drawing of townsites and city areas, while the mapping division add the contour lines and the stamping of the lettering and symbols. The Edmonton, Saskatoon, Blackfoot and Winnipeg sheets have been completed.

Under this heading may be considered a series of land classification maps. Maps of Fort Vermilion, St. Paul des Métis and Prince Albert districts were prepared as well as second editions of maps of Peace River district and the district west of lakes Winnipegosis and Manitoba. As these are intended for general distribution among prospective settlers, large editions are being printed.

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Miscellaneous Jobs.—Seven plans to accompany Orders in Council were prepared for printing, twenty-two commissions for Dominion land surveyors were engrossed, eighty-four printing jobs were done on the small hand-press, seven sets of astronomical field tables were made besides 807 other jobs of a miscellaneous nature.

SECTIONAL MAP DIVISION

Compiling

Sectional Maps, New Style.—The revision of sectional maps, based on the work of special revision parties, which was begun in 1919, was continued during the season of 1920 on a more extensive scale. Nine sheets were chosen for revision as follows: in Manitoba—Dufferin, No. 22, Emerson, No. 23 and Brandon, No. 72; in Saskatchewan—Moose Jaw, No. 69 and Regina, No. 119; in Alberta—Calgary, No. 114, Rosebud, No. 165, Red Deer, No. 215, and Peace Hills, No. 265.

Immediately on the selection of these sheets, steps were taken to have the office copies of the township plans covering the several areas brought up to date by the addition, from the records of the branch, of information concerning road diversions, railways, water areas, etc., and all the information obtainable from other departmental offices. Owing to the need of furnishing this information to the surveyors before leaving for the field so that they might plan their season's work to the best advantage, it was necessary to have a number of the plans prepared in other divisions of the office. Copies of all the plans thus amended were then made for the surveyors.

Accurate theoretical projections, on a scale of two miles to one inch, were made for the nine sheets and these were later adjusted for irregularities of survey in the governing and subdivision lines. All information on the township plans was transferred to these projections in pencil and they were made ready to hand to the surveyors when needed on their return from the field.

One part of the returns from the revision surveyors consists of plots on a large scale showing the built-up areas of villages, towns, and cities. Drawings of 246 of these were made for reduction by photography to the two-mile scale, the small photographic prints thus obtained being pasted in place on the finished black drawing.

Sectional Maps, Old Style.—The revision of sheets based on the work of special parties is restricted to the older settled parts of the country. The revision of sheets covering outlying districts and the compiling of new sheets by the office staff was continued. Two sheets, Fort Alexander, No. 123, and Shaftesbury, No. 513, revision of which had been begun last year, were completed, and one new sheet, Lake Claire, No. 665, was compiled. The revision of Donald sheet, No. 163, was begun.

Map of Mackenzie and Slave Rivers.—The eight-sheet map of Canada, which is the only map available of the Mackenzie River district, was taken as the base map. This was revised in this office by the addition of all available information and preparations were made to issue an up-to-date map of convenient size which could be placed in the hands of Government officials and others going into the north country.

The examination of surveyors' returns for names was continued as in past years and required the examination of 1,508 sketches, plans and plots, 209 field books, and 46 general reports. Considerable correspondence with surveyors and the Geographic Board was handled.

Mapping

Sectional Maps.—The great amount of information made available for use on the sectional maps by the work of the revision surveyors called for changes in the style of the maps themselves. The British ordnance maps were taken as the standard

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and the sectional maps were made to conform to them as closely as possible, due allowance being made for the widely different conditions under which our sheets are compiled and reproduced.

One very objectionable feature of the sectional maps has always been their checkerboard appearance due to the prominence of the section lines of the Dominion lands system of survey. This was overcome by printing section and township lines in a neutral tint which, while distinct enough for all purposes, does not obtrude itself on the eye. Water features and their names are in blue, contour lines are in brown, and woods, bush, scrub, etc., and the boundaries of forest reserves are in green. Railways, roads and trails, except Class 1 roads, telegraph and telephone lines, buildings, schools and churches, and all type matter for land features are in black. Gasoline stations, the boundaries of Indian reserves, and Class 1 roads are in red.

In making the finished drawings the programme is as follows: The original map on the two-mile scale, containing all information except contours, is photographed on the same scale and zinc plates are made. From these plates prints are made on heavy Joynson paper showing all lines in light blue. A separate drawing is then made for each colour, black, blue, brown, green and neutral, by selecting and tracing the proper lines of the prints, and these colour drawings are afterwards reduced to the three-mile scale by photography and zinc plates made therefrom for printing. No red drawing is made, this colour being handled as an offset proposition from the black plate after reduction to the three-mile scale.

The old-style maps are printed in four colours instead of six. They are made to conform to the new-style maps as far as possible.

Increased clearness and uniformity in text has been secured by the employment of type in place of hand lettering.

During the year the necessary colour drawings were prepared for four old-style sheets, namely: Fort Alexander, No. 123; Swan River, No. 221; Shaftesbury, No. 513, and Lake Claire, No. 665; and for four new-style maps, namely: Winnipeg, No. 73; Blackfoot, No. 114; Saskatoon, No. 218, and Edmonton, No. 315. Brandon, No. 72, is in hand.

Maps of the Boundary between Alberta and British Columbia.—The original sheets on the scale of 1 40,000 are photographed and zinc plates are made from which prints in light blue on heavy Joynson paper are taken as for the sectional maps. The colour drawings, namely black for surveyed lines, railways, boundaries and names, blue for water features, brown for contours, and red for roads and trails, are afterwards reduced to the scale of 1 62,500 for printing. Eight sheets were dealt with requiring thirty-two colour drawings each twenty inches by twenty-four inches.

SPECIAL SURVEYS DIVISION

Governing Surveys

Instructions were prepared for the survey of a portion of the Manitoba-Saskatchewan boundary line, a portion of the 18th base west of the Principal meridian, and a portion of the 18th base west of the Second meridian. Special care has been exercised to ensure that these lines, which are located in mining districts, are accurately laid down in their proper places. The field correspondence during the season was carried on, and the accuracy of the surveys when completed was carefully checked.

Retracement of Governing Surveys.—The work of retracing a portion of the Second meridian and the correction lines easterly therefrom through two or three ranges, which was begun in 1919, was continued and completed. The bearings of the lines in the three ranges immediately east of the Second meridian vary considerably

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from theoretic. This was caused by the difference in latitude between lines in Manitoba which depend on the survey of the Principal meridian, and corresponding lines in Saskatchewan which depend on the survey of the Second meridian, the lines of the old surveys in Manitoba being long distances north of their correct positions. In order to have correct returns of survey, it would be necessary to retrace nearly all the lines in two ranges immediately east of the Second meridian from township 1 to township 13, and in three ranges from township 14 to township 30. On account of the cost that this would entail, the retracements were limited to base lines and correction lines only.

The instructions for this work were prepared, the field correspondence carried out, the returns of survey examined, and the positions of corners in the Dominion lands survey system computed from the returns of survey of the lines retraced.

Revision of Sectional Maps

Instructions were prepared for five parties employed on the topographic revision of sectional maps. This division is also responsible for the preparing of all preliminary information and the examination and checking of all field work connected with the contouring or showing of the relief of the country. The necessary preliminary work consisted of collecting, examining and compiling all available level information in the areas to be surveyed. Our principal sources of information were the spirit-levels run by this branch and the profiles of the different railways. Use was also made of the results of engineering work done by the Reclamation Service, Geodetic Survey of Canada, Geological Survey and by the different provincial and municipal governments. About 1,300 miles of spirit-levels have been run by this branch in the areas selected for revision. Profiles of approximately 3,500 miles of railway lines in these areas were examined, equations obtained to reduce them to mean sea-level datum and the corrected elevations of all road crossings, railway stations and topographical features along the lines obtained. The information obtained from all other sources, with the exception of the Geodetic Survey, had also to be reduced to sea-level datum.

From these sources the elevations of all known points were compiled and supplied to the revision surveyors in convenient form, enabling them to complete their topographical work with little or no spirit-levelling. These elevations served as control for the aneroid readings from which are deduced the elevations required for contouring.

Each revision party is supplied with ten aneroids, six for field use, three for spare and one camp aneroid. The field aneroids are packed in specially designed padded cases, each containing three aneroids. They are read at all section and quarter-section corners, at notable topographical features, such as streams, lakes, edges and bottoms of valleys, and at ridges and points where the slope of the ground changes, the time being recorded as well as the aneroid readings. The resulting elevation is thus derived from the mean of readings on three different aneroids.

The field aneroids are controlled by readings on points of known elevation selected by the surveyor from skeleton sheets of his district compiled in the office. Wherever possible he is required to read on points of known elevation not more than two hours apart, but when the interval of time elapsing between checks on points of known elevation exceeds two hours the work is arranged to include repeat stations, that is to say, the route is crossed at some intermediate point on a subsequent day, thus obtaining two entirely independent sets of readings on that point. Comparison of these readings furnishes a good criterion of the accuracy of the work.

The camp aneroid is read at hourly intervals throughout the day. These readings show the changes in atmospheric pressure at different times throughout the day and provide corrections which are applied to the readings of the field aneroids.

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The aneroid records are reduced and examined in the office. The revision work of the season 1920-21 included 3,881 sheets of field records each containing the readings of three aneroids on 25 different points, making a total of upwards of 290,000 individual aneroid readings in addition to the camp aneroid readings.

The examination includes inspection and comparison of the readings to detect irregularities in behaviour of the aneroids, checking and plotting the changes recorded by the camp aneroids, taking out the means of the three aneroid readings in the field, applying the correction derived from the camp readings, converting readings in inches of barometric pressure to feet of elevation, checking the known elevations and applying the "correction to datum" which is the correction derived from readings of the aneroids at points of known elevation.

Astronomical Work

Azimuth Observations.—The examination of azimuth observations on governing lines surveyed and retraced during the season of 1920-21 included observations on the survey of the east boundary of townships 53 and 54, range 30, west of the Principal meridian, which forms part of the boundary between the provinces of Manitoba and Saskatchewan, the survey of parts of the eighteenth base line, west of the Principal and Second meridians, and the retracement of parts of the Second meridian, fourth base line, third, fourth, fifth, sixth and seventh correction lines, all west of the Principal meridian.

Altogether two hundred and fifteen individual observations were examined and the results tabulated and compared with the bearings recorded in the field books. The observation stations numbered sixty-two, controlling two hundred and seventy-three miles of line. The average number of observations at a station was 3.5 with an average range per station of eleven seconds.

Astronomical Field Tables.—Four sets of field tables for the position of the pole star were computed and printed. Two of the tables gave the azimuth of Polaris for every twentieth township for use by surveyors on Dominion lands and two give the azimuth for every second degree of latitude for use by surveyors in other parts of Canada. The periods covered are:—

October 12 to December 24, 1921.

August 23 to October 14, 1922.

June 13 to August 26, 1923,

and

December 25, 1921, to March 13, 1922.

March 17, 1923, to June 12, 1923.

Tables giving the apparent right ascension and declination of the sun for every day of the year with a table of corrections for refraction and parallax were also issued.

Magnetic Surveys

Thirty-three surveyors were instructed to observe for magnetic declination in the districts covered by their surveys. Separate instructions were issued to each surveyor together with a list of stations founded previously in the neighbourhood of his work at which repeat observations might be made. About nine hundred and fifty declination observations, including about thirty-five repeat observations, were obtained during the season. Observations for magnetic dip and total force were taken at six stations, which included two repeat stations.

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The above observations for magnetic dip and force and the declination repeat observations for 1919 will appear in the *Journal of the Royal Astronomical Society of Canada*.

The observations for declination, dip and force have been reduced to International Magnetic Standard, by direct comparison at the beginning and end of the season with the magnetic standards at the Magnetic Observatory, Agincourt, by courtesy of the Director of the Meteorological Service of Canada. The declination observations were reduced, as usual, to mean-of-month by direct comparison with the continuous declination magnetograms of the Magnetic Observatory at Meanook, Alberta, supplied by the Director of the Meteorological Service of Canada.

A publication entitled "Magnetic Observations in Western Canada with Three Isomagnetic Maps" was completed and is now in the hands of the printers. It shows in concrete form the very large amount of magnetic work that has been accomplished by this branch.

To supplement the construction of magnetic maps researches were made into various magnetic problems including magnetic deviations, secular change in declination, dip and total force, etc.

Many magnetic maps were distributed to applicants and several special maps of the Mackenzie River district were supplied to oil prospectors and others travelling to Fort Norman. Correspondence in regard to magnetic information was carried on with many individuals and commercial firms and scientific and government authorities.

Surveying Instruments

Repairs were made to sixty-three transits, nine levels, four levelling rods, fifteen aneroid barometers, three kodaks, twelve instrument cases, five tripods and seventeen miscellaneous instruments. Eleven sidereal watches were overhauled and readjusted.

Incidental to the inspection of instruments and outfitting of surveyors, 244 cases aggregating five tons (10,561 pounds) were shipped from this office, and 238 cases weighing six tons (12,155 pounds) were received.

A statement of instruments on hand on March 31, 1921, showing also the instruments purchased and sold during the year is given in Appendix No. 5.

Miscellaneous Work

The computations required for determining the latitudes and longitudes of the new sectional sheets issued during the year have been made and the necessary data furnished. In addition, memoranda of all known irregularities of survey in the areas covered by the sheets issued have been prepared.

A new index map was printed showing precise, secondary, meridian and baseline levels run by this branch up to December 31, 1920.

Information was furnished the Air Board of Canada showing latitude, longitude and height above sea-level of aerodromes throughout Canada.

The usual supplies of survey posts were provided. Engraved brass plates for concrete monuments were supplied for the Alberta-British Columbia interprovincial boundary survey. Standard survey posts, short rock survey posts and engraved brass plates for the concrete monuments were designed for the Ontario-Manitoba interprovincial boundary survey. These were suitably inscribed with the names and coats of arms of the respective provinces executed in colours. The various other devices and tools necessary on this survey were also designed and constructed by this division.

A new "Nomogram for Use in Sunlight Engineering" was designed and published. A full description will appear in the April, 1921, number of the *Journal of the Royal Astronomical Society of Canada*, together with a general review of azimuth tables, nomograms, abaci, diagrams, etc., dealing with the same subject.

SURVEYS LABORATORY

The additional space now available at the Surveys Laboratory has made it possible to conduct the work, which continues to grow in volume, much more efficiently. It is gratifying to note in this connection that increasing use is being made of the laboratory by interested persons and by other departments. The various bulletins describing the tests and equipment are in great demand.

Metrology.—The construction of the main portion of the 1^m comparator has been completed and the comparator partly installed. Due to the delay on the part of the contractor and pressure of other work at the laboratory, it has not been possible to make as good progress as was anticipated. Specifications were prepared for two micrometer microscopes of special construction for use with this comparator. Quotations on these microscopes have been received from various optical firms and it is hoped that an order for the microscopes will be placed shortly. Until these are received two of the regular laboratory microscopes will be utilized.

The delivery of the 1^m nickel and 1^m forty-two per cent nickel-steel rules has been further delayed, but the work of verifying these rules at the International Bureau has now been completed and they should be received very shortly.

The 32^m base was verified twenty-seven times with the 4^m rule, and the 4^m rule eleven times with the standard 1^m rule.

The laboratory standard tapes and wires were compared with the base one hundred and thirty-four and forty-four times respectively.

The lengths and weights of sixty-six tapes of all kinds were determined.

A bulletin entitled "Standardization of Measures of Length at the Laboratory of the Dominion Lands Surveys" has been prepared, and is now in the press. This gives a very complete description of the building and apparatus used in verifying measures of length.

Transits, Levels, etc.—The work of this section has increased, particularly in the case of optical tests, due to the number of instruments received from other departments. Tests were made of eighty-four D.L.S. transits, twenty-seven levels, two hundred and ninety-seven aneroid barometers, fifteen surveying cameras, eleven watches, one stormograph, three aeroplane cameras, eleven thermometers, twenty-one level vials, six range finders, one planimeter, thirty binoculars, and fourteen telescopes and objectives.

Thermometers.—The thermometer-testing apparatus, including the oil-bath comparator, has been installed in one of the new rooms specially fitted for this work.

The distribution of Bulletin No. 45, on the testing of mercury thermometers, has stimulated public interest in the work of this section and a number of thermometers, including clinical thermometers, have been received with requests that they be tested. In this connection it may be pointed out that the Surveys Laboratory is the only one in Canada possessing facilities for the accurate testing of thermometers.

Aneroids.—The aneroid-testing apparatus has been installed in the new quarters. The increased space now available has made it possible to provide additional testing receivers and a greater number of aneroids can be handled without undue delay. Further additional pieces of apparatus have been installed to aid in the testing and experimental work of this section. Among these might be mentioned a mercury air-pump for the complete exhaustion of aneroid diaphragms, a "Cenco" air-pump for exhausting the receivers, and an automatic apparatus for ageing the aneroids by repeatedly working them over their ranges.

The work of this section would be greatly benefited if it were possible to obtain a small refrigerating outfit for low-temperature tests. The present method of circu-

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lating ice-water around the receiver, besides being unsuited for the large number of aneroids now dealt with, does not permit of the attainment of the low temperatures at which instruments intended for use in this climate should be tested.

A certain amount of investigation has been conducted with the object of reducing the errors in the indications of the aneroid barometers. The errors considered were those due to hysteresis effect and to defects in the standard design and construction of the mechanism. The results so far obtained in the work appear to be very promising.

SURVEY RECORDS DIVISION

The essential work of the Survey Records Office consists in recording the original plans, field notes and other returns of surveys of Dominion lands and furnishing copies of the same.

This office was at one time a part of the Topographical Surveys Branch but, on account of lack of filing space for the large number of books and plans recorded, it was located in a separate building remote from that occupied by the branch proper. With the addition of other work based upon the information contained in these records the office became a separate branch of the department.

This office is more closely related to the Topographical Surveys Branch than to any other branch in the service, as all original field notes and plans, numbering to date approximately 17,000 and 31,000 respectively, are sent there for record and are being constantly referred to in answering the numerous inquiries about surveys. It was considered advisable both for convenience and in the interest of economy to reunite the records office with this branch, and all the records have accordingly been recently moved to a building adjoining the new quarters in which this branch is now located.

Rearrangement and reorganization of the Survey Records Office is under way. It is proposed to transfer a portion of the work to the Land Patents Branch of the department. This will necessitate the transfer of several members of the staff who are familiar with the work.

The essential work of recording returns of survey and attending to the distribution of plans printed by the Topographical Surveys Branch will be retained. Copies of these plans are sent out to officials whose names are on the mailing lists and the balance of the stock is kept in store for distribution and sale as required.

In connection with the reorganization, arrangements have been made to prepare a new and improved index for all field books and plans recorded or to be recorded in the future.

PHOTOGRAPHIC DIVISION

The staff consists of general photographers and process workers.

Although much delay and inconvenience was occasioned this division by the removal of the branch to new quarters, the output of work by the general photographers shows an increase over that of the previous year. It consisted principally of developing, printing and enlarging, but additional work included the repairing and testing of surveyors' cameras and plate holders and the indexing of negatives.

The bulk of the work completed was in connection with photo-topographical surveys of Bow River and Clearwater forest reserves and the survey of the boundary between the provinces of Alberta and British Columbia. Photo-enlargements were supplied to the surveyors in charge and extra prints were made and mounted in albums for office reference. More experience in the use of the pocket camera by surveyors in the field resulted in a greater number of negatives being sent in for developing and printing. The photographs continue to show much improvement and add greatly to the value of the surveyors' reports.

Some new work consisting of photographing, printing and tinting relief maps was undertaken and work of an experimental nature was also done in connection with an aerial survey of Ottawa and vicinity. A mosaic map on a scale of 1,000 feet to an inch was compiled and prepared from negatives supplied by the Air Board of Canada.

The delayed installation of the photo-mechanical plant resulted in a decrease in the yearly output of wet-plate process negatives and photo-lithographic plates. In order to cope with the accumulated work reproduction by blue-printing from tracings and Vandyke negatives was resorted to whenever possible. The Vandyke process of zincography was used with varying success. The method of reproducing township plans showing land classification by blue-prints from Vandyke negatives did not give as satisfactory results as the wet-plate process formerly used.

Eight sectional maps, five of which were of the new series, were reproduced for printing. Since the new-style maps are in six colours as compared with three colours on the old-style maps the work of photographing, retouching and printing is more than doubled.

There was an increased demand for line and half-tone etchings for office use and departmental publications and although the division is not thoroughly equipped for such work good service was maintained.

Only during the latter part of the year was the staff in a position to attend to the demands of other branches and departments.

Details and figures of the work executed are given in Appendix No. 4.

LITHOGRAPHIC DIVISION

A comparison with the previous year shows a decrease of about sixty-nine per cent in the output of this division.

This was principally due to the temporary suspension of work occasioned by the removal of the branch to new quarters. The dismantling to facilitate moving, and the setting up again of the printing presses and other apparatus, together with the delay in the transfer and installation of the photo-mechanical plant, which is closely connected with the work of the lithographic office, resulted in this division being idle or not running to capacity for a period of more than four months. There was a decrease in the number of copies of about sixty-one per cent and a decrease of about forty-six per cent in the number of impressions.

The following table shows the costs for the last two years of the lithographic work turned out by this office estimated at Printing Bureau rates, or what it would have cost the Government had this work been done by commercial firms through the Bureau:—

Item	Number printed		Cost at Bureau rates	
	1919-20	1920-21	1919-20	1920-21
			\$ cts.	\$ cts.
Township plans.....	1,020	254	42,251 42	9,223 51
Sectional maps.....	75	49	4,338 79	4,673 82
Sundry jobs.....	940	338	24,230 60	23,855 57
	2,035	641	70,820 81	37,752 90

Adding to this the cost of the paper and percentage for handling allowed by the Bureau (\$6,125.80 and \$4,702.20), gives totals of \$76,946.61 and \$42,455.10, respectively.

Considering the decreases in the number of sectional maps and sundry jobs printed, as compared with the previous year, the cost of these items for 1920-21 is comparatively higher. In the case of sectional maps the high cost is due to the

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printing of larger stocks and the use of more colours than formerly, particularly on the new-style maps. Of the three hundred and thirty-eight sundry jobs turned out, one hundred and sixty-one were reprints of township plans the majority of which required from two to five colours, thus increasing greatly the number of impressions and consequently the cost. Sundry jobs also included forty-one miscellaneous maps many of which required several colours.

The statement given below is an estimate of the cost of maintenance of this division such as would be prepared by a private firm engaged in this kind of work; it includes such items as interest, depreciation, and other overhead charges which are not actually paid by the Government. The saving to the Government is shown in the statement.

	1919-20	1920-21
	\$ cts.	\$ cts.
Process Photographers—		
Chemicals, zinc, glass, stationery, etc.....	1,260 86	1,405 96
Rent.....	562 50	1,215 00
Power and light.....	127 84	115 06
Heating, cleaning, fireman, caretaker, etc.....	310 00	310 00
Interest and depreciation.....	577 25	577 25
Insurance.....	12 51	12 51
Salaries.....	10,715 93	6,445 61
	13,566 89	10,081 39
Less one-third for time on other than lithographic work.....	4,522 30	3,360 46
Total.....	9,044 59	6,720 93
Lithographers—		
Supplies.....	1,630 07	1,612 56
Rent.....	875 00	1,890 00
Power.....	166 02	149 42
Paper.....	6,125 80	4,702 20
Interest and depreciation.....	2,772 61	2,772 61
Insurance.....	60 07	60 07
Wages.....	13,642 27	16,255 20
Total.....	25,271 84	27,442 06
SUMMARY		
Process Photographers.....	9,044 59	6,720 93
Lithographers.....	25,271 84	27,442 06
Total.....	34,316 43	34,162 99
Value of work at Bureau rates.....	76,946 61	42,455 10
Saving.....	42,630 18	8,292 11

It will be observed from the above schedule that the cost of maintenance of the division varies little from year to year as the staff generally remains the same and the amount of paper used from year to year is fairly uniform.

The difference for the two years of more than \$34,000 in the value of work at Bureau rates is partly due to the long period of enforced idleness of the lithographic plant during the year 1920-21. It is also partly due to the fact that for different reasons there was a decrease of approximately seventy-five per cent, as compared with the previous year, in the number of township plans printed. It is a peculiarity of the work of our lithographic office that for plans and maps, which constitute the greater part of the output, the number printed is large while the number of copies of each is small. Commercial firms are not equipped for doing this work as economically as it can be done in this branch.

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GEOGRAPHIC BOARD

The Geographic Board, of which the secretary is an officer of the Department of the Interior, published in book form lists of Miemac place-names recorded by Rev. Dr. Silas T. Rand, who spent over forty years, from 1849 till his death in 1890, as a Baptist missionary among the Miemac Indians of the Maritime Provinces. The names were arranged and indexed by Lieut.-Colonel W. P. Anderson, C.M.G., F.R.G.S., a member of the board, and the book was photo-lithographed from typed manuscript and printed at the Surveyor General's office.

During the year Mr. E. V. Johnson, representative of the Department of Railways and Canals, resigned from the board on retirement from the public service and was replaced by Mr. H. LeBreton Ross.

BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS

The Board of Examiners for Dominion Land Surveyors held two meetings.

The first was a special meeting lasting from May 3, 1920, to June 15, 1920, during which examinations were held at Ottawa, Montreal, Winnipeg, Calgary and Edmonton.

The second was the regular annual meeting called for by section 9 of the Dominion Lands Surveys Act. It began on February 14, 1921, and lasted until March 17, 1921. During this meeting examinations were held at Ottawa, Winnipeg, Calgary, Edmonton and Vancouver.

The total number of candidates who presented themselves at the examinations was eighty-five. Of these, forty tried the preliminary examination, sixteen tried the final examination, twenty-eight tried the leveller's examination, and one tried the examination for Dominion topographical surveyors.

Four candidates were successful at the preliminary examination, as follows:—

Davis, Sydney Herbert, Ottawa, Ont.
 Haney, Reuben John, Regina, Sask.
 Lewis, David Joseph, Ottawa, Ont.
 Radley, Percy Edward, Ottawa, Ont.

Seven candidates were successful at the final examination, as follows:—

Gammon, Albert Osborne, Ottawa, Ont.
 Lawrence, Charles Albert Rutter, Ottawa, Ont.
 MacDonald, Leslie Stuart, Ottawa, Ont.
 McDonald, John Nicholson, Ottawa, Ont.
 Roe, Bertie James, Ottawa, Ont.
 Underhill, Frederick Clare, Vancouver, B.C.
 Underhill, James Theodore, Vancouver, B.C.

Thirteen candidates were successful at the leveller's examination as follows:

Bryden, Richard Burns, Edmonton, Alta.
 Butchart, Harold Tremayne, Edmonton, Alta.
 Cameron, John Albert, Calgary, Alta.
 Denmark, Donald Ernest, Winnipeg, Man.
 Forward, Frank Arthur, Ottawa, Ont.
 Fraser, Arthur, Calgary, Alta.
 Greenwood, Howard Fraser Stewart, Edmonton, Alta.
 Haw, John Leonard, Edmonton, Alta.
 Jewitt, William Gladstone, Edmonton, Alta.
 Lawrence, Charles Albert Rutter, Ottawa, Ont.
 Lebourveau, Homer B., Calgary, Alta.
 Patterson, William Bennett, Winnipeg, Man.
 Trueman, James Cobden, Winnipeg, Man.

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One candidate was successful at the examination for Dominion topographical surveyors, namely:—

Montgomery, Royal Harp, Calgary, Alta.

The time of the board during the meetings was largely taken up with the reading and valuation of the candidates' answer papers; complete sets of question papers to be used at the following examination were also prepared. In addition to this the evidence submitted by candidates at the final examination, in proof of their eligibility therefor, had to be examined. This evidence consisted of certificates of provincial land surveyors and of affidavits of service under articles of apprenticeship. The finished plans and notes as well as the plans and notes executed under field conditions, furnished by the candidates at the final examination, had also to be examined and valued.

Nine commissions were issued to candidates who had passed the final examination and had furnished oaths of office and allegiance and bonds for the sum of one thousand dollars, as required by section 25 of the Dominion Lands Surveys Act.

Five certificates of preliminary examination were issued to successful candidates who had complied with the requirements of the law.

Sixteen certificates as levellers were issued to candidates who had successfully passed the examination.

One certificate of Dominion topographical surveyor was issued to a candidate who had successfully passed the examination and complied with the requirements of the law.

Mr. R. H. Montgomery, D.T.S., was appointed a presiding examiner by Order in Council in accordance with section 12 of the Dominion Lands Surveys Act, and is therefore qualified to conduct examinations for Dominion land surveyors at any centre where the board may direct.

Section 35 of the Dominion Lands Surveys Act provides that every Dominion land surveyor shall be in possession of a subsidiary standard of length, and that such standards are to be tested by the department at least once every four years.

Moreover, it was found that the graduations on the old style of standard measures, possessed by a great many surveyors, were too coarse to permit of the fine and delicate tests which are applied to these instruments from time to time at the departmental laboratory. In consequence of this the Dominion land surveyors who were actively engaged on surveys of Dominion lands were invited to provide themselves with standard measures of a new and approved pattern, the price of which is at present \$10. Surveyors who sent in their old standard measures were furnished with new ones upon the payment of \$2, the difference in price between the old and new tapes.

During the year fifty new standard measures were issued to surveyors; twelve of these were secured by Mr. T. S. Gore, D.L.S., secretary of the Association of British Columbia Land Surveyors, to be distributed to British Columbia land surveyors. Fourteen Dominion land surveyors sent in their old measures in exchange for the new style of tape approved by the department. Seven surveyors already in possession of approved standards sent them in to be tested. Three standards were also inspected by the staff of the laboratory; one was found to be in good condition, while the other two were condemned as obsolete. One duplicate certificate of test was issued to a surveyor who had lost the original document.

On December 15, 1920, the Secretary of the Board of Examiners for Dominion Land Surveyors was appointed Secretary of the Instrument Committee of the Department of the Interior. This committee is made up of the following:—

Chairman—

R. J. Burley, Reclamation Service.

Members—

A. M. Beale, Dominion Water Power Branch.
D. F. Blyth, Supply and Stationery Branch.
J. D. Craig, International Boundary Commission.
G. B. Dodge, Topographical Surveys Branch.
A. Gorman, Forestry Branch.
T. S. Mills, Dominion Parks Branch.
J. L. Rannie, Geodetic Surveys.
Thos. Shanks, Assistant Surveyor General, Topographical Surveys Branch.
R. M. Stewart, Assistant Director, Dominion Observatory.

Secretary—

J. Aurele Coté, Topographical Surveys Branch.

The object of this committee is to consider the purchase of all scientific instruments and apparatus in connection with the engineering and surveying requirements of the Department of the Interior, to see that the best conditions are taken advantage of both as regards prices and the quality and standard of the instruments, and to recommend to the deputy minister the purchases from certain specified firms.

When any of the branches require instruments, the secretary is notified and furnished with details and specifications. He then calls for sealed tenders from reliable firms who deal in such instruments and tabulates the tenders when they are received, in order that they may be expeditiously considered by the members of the committee. A meeting is then called at which the committee discusses the different tenders, and recommends that the purchase be made from the firm offering the most advantageous terms. The secretary must notify the members and make arrangements for all the meetings, keep the minutes of these meetings and furnish copies of all the transactions to the deputy minister and the different members. During the three and one-half months from December 15, 1920, to April 1, 1921, five meetings were held, 240 letters were received, and 1,125 letters, circulars and notices were sent out.

The secretary of the board also assisted Mr. E. W. Hubbell, D.L.S., Chief Inspector of Surveys, in the preparation of a pamphlet describing in detail a section of northern Alberta surrounding Fort Vermilion and comprising some 14,000 square miles. The work of compiling and editing this pamphlet is now almost completed.

On April 23, 1920, the Secretary of the Board of Examiners for Dominion Land Surveyors moved from the Imperial Building, 138 Queen street, to new offices at 130 Wellington street.

The board room, which was formerly located in the secretary's office in the Imperial Building, is now situated at 130 Wellington street.

APPENDIX No. 1

AREA OF SURVEYED LAND IN MANITOBA, SASKATCHEWAN, AND ALBERTA.

Period	Acres	Number of Farms of 160 Acres each
Previous to June, 1873	4,792,292	29,952
1874	4,237,864	26,487
1875	665,000	4,156
1876	420,507	2,628
1877	231,691	1,448
1878	306,936	1,918
1879	1,130,482	7,066
1880	4,472,000	27,950
1881	8,147,000	50,919
1882	10,186,000	63,662
1883	27,234,000	170,212
1884	6,435,000	40,218
1885	391,680	2,448
1886	1,379,010	8,620
1887	643,710	4,023
1888	1,131,840	7,074
1889	516,968	3,231
1890	817,075	5,106
1891	76,560	476
1892	1,395,200	8,720
1893	2,928,640	18,304
1894	300,240	1,876
1895	406,240	2,539
1896	506,590	3,166
1897	428,640	2,679
1898	859,840	5,374
1899	1,022,720	6,392
1900 (first 6 months)	735,480	4,596
1900-1901	1,603,680	10,023
1901-1902	2,553,120	15,957
1902-1903	6,173,440	38,584
1903-1904	12,709,600	79,435
1904-1905	10,671,520	66,697
1905-1906	4,973,920	31,087
1906-1907 (9 months)	3,819,700	23,873
1907-1908	6,123,040	38,269
1908-1909	7,412,870	46,330
1909-1910	7,423,200	46,395
1910-1911	5,683,200	35,520
1911-1912	5,146,080	32,163
1912-1913	5,155,520	32,222
1913-1914	5,193,280	32,458
1914-1915	4,484,960	28,031
1915-1916	3,112,640	19,454
1916-1917	2,221,280	13,883
1917-1918	1,323,360	8,271
1918-1919	91,520	572
1919-1920	317,920	1,987
1920-1921	488,480	3,053
	178,481,505	1,115,504

APPENDIX No. 2

SCHEDULE of surveyors employed and work executed by them:—

Akins, J. R., Ottawa, Ont.—

Topographical mapping for the revision of the Rosebud sectional map, comprising townships 25 to 32, ranges 16 to 29, west of the Fourth meridian, and of the easterly portion of the Calgary sectional map, comprising townships 17 to 24, ranges 1 to 4, west of the Fifth Meridian. Correction survey in tp. 29-21-4. Traverse in tp. 29-21-4; tp. 30-21-4.

Alexander, J. B., Calgary, Alta.—

Secondary levels along the 10th base line across ranges 23 to 28, west of the Fourth meridian and along the 12th base line from the Fourth meridian to the Fifth meridian, 201 miles.

Bennett, G. A., Tillsonburg, Ont.—

Stadia surveys in tp. 31-17-Pr.; tps. 26 to 31-18-Pr.; tps. 27 to 37-19-Pr.; tps. 27 to 30, 33 to 35 and 37-20-Pr.; tps. 27 to 30-21-Pr.; tps. 27 to 33-22-Pr.; tps. 26 to 30 and 32 to 35-23-Pr. Retracement in tps. 35 and 37-20-Pr. Investigation of settlement and subdivision surveys in tps. 35, 36 and 37-19-Pr.

Berry, E. W., Calgary, Alta.—

Secondary levels along the east boundary of range 13, west of the Third meridian, from the international boundary to township 27, 165 miles.

Blanchet, G. H., Ottawa, Ont.—

Survey of the east outline of tp. 53-30-Pr. and of part of the east outline of tp. 54-30-Pr., being a portion of the boundary between the provinces of Manitoba and Saskatchewan. Part subdivision for the Soldier Settlement Board, in Riding Mountain forest reserve, of tp. 19-18-Pr.; tps. 19 and 20-19-Pr.; tp. 19-20-Pr. Retracement in tp. 17-18-Pr.; tp. 20-20-Pr.; tp. 41-3-3; tp. 39-4-3. Establishment of corners in tp. 44-21-2.

Boulton, W. J., Wallaceburg, Ont.—

Topographical mapping for the revision of the Moose Jaw sectional map, comprising townships 9 to 16, from range 16 west of the Second meridian westerly to the Third meridian, and of the Regina sectional map, comprising townships 17 to 24, from range 16 west of the Second meridian westerly to the Third meridian. Stadia survey in tp. 20-20-2; tp. 22-27-2.

Bowman, E. P., West Montrose, Ont.—

Exploration and the establishment of a line of control by stadia traverse of the larger lakes and connecting rivers and streams in northern Manitoba from a point where the 18th base line intersects the easterly shore of Setting lake in tp. 68-9-Pr. northeasterly to the east boundary of tp. 84-11-E.

Brenot, L., Ottawa, Ont.—

Investigation and classification of land for general settlement in fifty-three townships adjacent to the Sixth meridian, east of Grande Prairie, Alta.

Bridgland, M. P., Calgary, Alta.—

Photo-topographical survey of portions of the Bow River and Clearwater forest reserves in tps. 31 to 34-8-5; tps. 31 to 35-9-5; tps. 31 to 35-10-5; tps. 31 to 35-11-5; tps. 32 to 35-12-5; tp. 28-14-5. Stadia surveys in tps. 33 and 34-8-5; tps. 32 and 33-9-5; tp. 32-10-5; tp. 32-11-5.

Calder, J. A., Ashcroft, B.C.—

Subdivision in tp. 22-21-6; tp. 12-28-6; tp. 3-29-6; tp. 16 E.C.M. Traverse in tp. 20-25-6; tp. 3-28-6. Delimitation of the north limit of the railway belt in tp. 6-30-6; tp. 7-30-6. Survey of lots for the Soldier Settlement Board and location of right of way for logging railway in tp. 2 W.C.M. Investigation in tp. 12-26-6.

Cautley, R. W., Edmonton, Alta.—

Preliminary survey of a portion of the 120th meridian (interprovincial boundary) being the west boundaries of townships 67 to 73 and part of the west boundary of township 66, Traverse in tp. 70-13-6; tp. 70-14-6.

Christie, W., Prince Albert, Sask.—

Clearing of land by controlled fires in tps. 42 and 43-7-2; tps. 42 and 43-8-2. Stadia surveys in tps. 50 and 51-24-2; tps. 49 to 52-25-2; tps. 49, 51 and 52-26-2; tps. 48 to 52-27-2; tps. 48 to 51-28-2; tps. 45, 46, 48 and 49-1-3; tps. 45, 46 and 48 to 50-2-3; tps. 45, 46, 48, 49 and 51-3-3; tps. 49, 51 and 52-4-3; tps. 48 to 52-5-3; tps. 49 to 52-6-3.

SESSIONAL PAPER No. 25a

Cowper, G. C., Ottawa, Ont. —

Stadia surveys in tps. 1 and 2-18-4; tps. 1 to 4-19-4; tps. 1 to 4-20-4; tps. 1 to 4-21-4; tps. 1 to 4, 6 and 7-22-4; tps. 1 to 6-23-4; tps. 1 to 5 and 7-24-4; tps. 1 to 7-25-4; tps. 1 to 3 and 5 to 7-26-4; tps. 1 to 6-27-4; tps. 1 to 7-28-4; tps. 1 to 9-29-4; tps. 3 to 8-30-4; tps. 4 to 10-1-5; tp. 6-2-5.

Cumming, A. L., Cornwall, Ont.—

Clearing of and by controlled fires in tp. 43-8-2; tp. 43-9-2. Retracement and resurvey in tps. 21 and 22-1-Pr.; tp. 24-12-Pr.; tp. 35-23-Pr.

Davies, T. A., Ottawa, Ont.—

Stadia surveys in tp. 56-23-4; tp. 53-25-4; tps. 51, 52 and 53-26-4; tps. 52 and 53-27-4; tps. 52 and 53-28-4; tps. 52 and 53-1-5; tps. 52 and 53-2-5. Miscellaneous survey in tp. 45-1-6. Correction survey in tp. 49-23-4. Survey of additional lots and establishment of lot corners at Jasper, Alta., in tp. 45-1-6.

Dozois, L. O. R., Calgary, Alta.—

Precise levels along the Canadian Pacific railway from Eyebrow to Moose Jaw; along the Canadian Pacific railway from Weyburn easterly to Findlay Crossing, thence along the Canadian National railway southeasterly via Hartney and Minto to Hartney Junction, thence northwesterly to Brandon. Total—305 miles.

Evans, S. L., Corinth, Ont.—

Examination and classification of land for soldier settlement in eighty-three townships in the St. Paul de Metis district, from range 1 to range 17 west of the Fourth meridian.

Fawcett, S. D., Ottawa, Ont.—

Settlement surveys at Patunak, Bélanger, Stanley, La-Ronge and Ile-à-la-Crosse, in the Churchill river basin, in northern Saskatchewan.

Fletcher, W. A., Barrie, Ont.—

Investigation of land and clearing of portions by controlled fires in tps. 73 and 74-2-6; tps. 73 and 74-3-6. Stadia surveys in tp. 23-4-Pr.; tps. 18 to 20, 22 and 23-5-Pr.; tps. 19 to 23 and 32-6-Pr.; tps. 20 to 24 and 32-7-Pr.; tps. 21, 22 and 24-8-Pr.; tps. 22, 23 and 31-9-Pr.; tp. 22-10-Pr. Retracement surveys in tp. 14-3-E.; tps. 22 and 24-7-Pr.; tp. 24-8-Pr.; tp. 31-9-Pr.

Fontaine, L. E., Quebec, P.Q.—

Part subdivision of tp. 107-13-5; tp. 110-13-5; tp. 109-14-5; tp. 110-14-5; tp. 109-15-5. Stadia traverse in tp. 110-15-5.

Glover, A. E., Edmonton, Alta.—

Part subdivision of tps. 74, 75 and 76-1-E.; tps. 75 and 76-2-E.; tps. 76 and 77-3-E.; tps. 73 and 74-1-Pr.

Hardouin, J., Ottawa, Ont.—

Subdivision of tp. 55-26-2. Part subdivision of tp. 53-23-2; tp. 54-26-2; tp. 53-1-3; tp. 53-2-3; tp. 53-3-3; tp. 53-4-3. Stadia traverse in tp. 52-2-3; tp. 54-4-3.

Herriot, G. H., Winnipeg, Man.—

Topographical mapping for the revision of the Emerson sectional map, comprising townships 1 to 8, ranges 1 to 11, east, and ranges 1 to 4, west of the Principal meridian, and of a portion of the Dufferin sectional map, comprising townships 1 to 8, ranges 5 to 9, west of the Principal meridian.

Hotchkiss, C. P., Ottawa, Ont.—

Part subdivision of tps. 108 and 109-7-5; tps. 107 and 108-8-5. Stadia traverse in tp. 109-6-5.

Johnston, W. J., Vancouver, B.C.—

Survey of lots for the Soldier Settlement Board and location of right of way for a logging railway in tp. 2 W.C.M. Survey of lots in tp. 5-7-7. Investigation in tp. 19 E.C.M.

Knight, R. H., Edmonton, Alta.—

Investigation of land and clearing of portions by controlled fires in tps. 81 and 82-19-5; tps. 81, 82 and 83-20-5; tps. 82 and 83-21-5. Part subdivision of tps. 74 and 75-12-6; tps. 73 to 76-13-6; tp. 74-14-6.

LeBlanc, P. M. H., Ottawa, Ont.—

Stadia surveys in tps. 30 to 37-1-2; tps. 31 to 37-2-2; tps. 30 to 37-3-2; tps. 31 to 38-4-2; tps. 31 to 38-5-2; tps. 31 to 37-6-2; tps. 31 to 34 and 37-7-2; tps. 30 and 31-8-2; tp. 30-9-2; tp. 30-10-2; tps. 30 and 31-11-2; tps. 29 and 30-12-2; tps. 29 and 30-15-2; tps. 28, 29 and 30-16-2. Retracement in tp. 37-5-2; tps. 33 and 34-6-2. Survey of cemetery in southeast quarter of section 36, tp. 31-2-2.

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Lonergan, G. J., Buckingham, P.Q.—

Supervision of the clearing of lands by controlled fires in Porcupine forest reserve by survey parties under A. L. Cumming, D.L.S., and W. Christie, D.L.S. Inspection of survey parties under the following Dominion Land Surveyors:—On subdivision—J. A. Calder, R. H. Knight, W. H. Norrish, H. E. Pearson, N. C. Stewart, J. Vicars. On stadia surveys—W. Christie. On the survey of the Alberta-British Columbia boundary—R. W. Cautley.

Martindale, E. S., Aylmer, Ont.—

Retracement in tp. 48-1-E.; tp. 28-5-E.; tp. 22-8-E.; tp. 26-9-E.; tp. 48-1-Pr.; tp. 15-3-Pr.; tp. 6-25-Pr.; tp. 7-25-Pr.; tp. 6-26-Pr.; tp. 28-31-Pr.; tp. 20-17-3; tp. 24-23-3; tp. 23-24-3; tp. 24-24-3; tp. 23-25-3; tp. 24-25-3. Correction survey in tp. 7-17-E.; tp. 8-17-E.; tp. 20-1-2. Retracement and correction surveys in tp. 25-9-E.; tp. 15-2-Pr.; tp. 16-5-2; tp. 19-5-2. Stadia surveys in tp. 14-2-Pr.; tp. 25-16-2. Mounding in tp. 19-4-E.; tp. 32-32-Pr. Investigation in tp. 9-26-Pr.; tp. 9-27-Pr. Survey of historical site in tp. 32-32-Pr. Survey of lots at Sandy Lake in tp. 18-20-Pr. Survey of settlement lots and location of road on Matheson island in tp. 32-4-E.

Melhuish, P., Vancouver, B.C.—

Stadia surveys in tps. 53 to 55-24-4; tps. 53 to 55-25-4; tp. 54-26-4; tps. 53 to 55-27-4; tps. 53 and 54-28-4; tps. 53 and 54-1-5.

Montgomery, R. H., Calgary, Alta.—

Secondary levels along the 5th base line from the east boundary of range 13, west of the Third meridian, to the Fifth meridian—277 miles.

Macdonald, C. S., Ottawa, Ont.—

Investigation and classification of lands for general settlement in the area surrounding Waterhen lake and river and extending southeasterly along the north and east shores of lake Manitoba.

McCloskey, M. D., Ottawa, Ont.—

Investigation and classification of lands for soldier settlement in fifty-two townships north of Prince Albert, Sask.

McGarry, P. J., Merritton, Ont.—

Stadia surveys in tps. 23 to 26-10-Pr.; tps. 23 to 27-11-Pr.; tps. 24 to 28-12-Pr.; tps. 23 to 28-13-Pr.; tps. 23 to 26-14-Pr.; tps. 23 to 26, 29, 30, 34 and 35-15-Pr.; tps. 23 to 26, 30, 34 and 35-16-Pr.; tps. 23 to 26-17-Pr.; tps. 24 to 26-18-Pr.; tps. 17 and 24 to 26-19-Pr.; tps. 17 and 26-20-Pr.; tp. 18-21-Pr.; tps. 18 to 20-26-Pr.; tps. 19 and 20-27-Pr. Retracement in tp. 25-11-Pr.; tp. 26-12-Pr.; tp. 25-14-Pr.; tp. 26-16-Pr. Subdivision in tp. 34-15-Pr.; tp. 34-16-Pr.

McKay, R. B., Vancouver, B.C.—

Retracement of the Second meridian through townships 11 to 24; the 3rd correction line through ranges 33 and 34 west of the Principal meridian; the 4th correction line through ranges 31 to 34 west of the Principal meridian; the 5th, 6th and 7th correction lines through ranges 31 to 33 west of the Principal meridian and the 4th base line through ranges 32 to 34 west of the Principal meridian.

Nurraway, A. M., Ottawa, Ont.—

Inspection of survey parties under the following Dominion Land Surveyors:—On base line surveys—B. W. Waugh. On subdivision—G. H. Blanchet, L. E. Fontaine, A. E. Glover, J. Hardouin, C. P. Hotchkiss. On stadia surveys—G. A. Bennett, E. P. Bowman, W. Christie, G. C. Cowper, T. A. Davies, P. M. H. LeBlanc, P. Melhuish, P. J. McGarry, C. Rinfret, C. H. Taggart, C. M. Walker. On topographical surveys—J. R. Akins, W. J. Boulton, G. H. Herriot, P. E. Palmer, J. W. Pierce. On land classification surveys—L. Brenot, S. L. Evans, C. S. Macdonald, M. D. McCloskey. On levelling—J. B. Alexander, E. W. Berry, L. O. R. Dozois, R. H. Montgomery, H. E. Read. On retracement and resurveys—A. L. Cumming, R. B. McKay.

Norrish, W. H., Guelph, Ont.—

Survey of the 19th base line through ranges 13 and 14 west of the Sixth meridian. Part subdivision of tps. 69, 70 and 71-13-6; subdivision of tp. 72-13-6; tps. 71 and 72-14-6. Stadia surveys in tp. 73-12-6; tp. 73-13-6.

Palmer, P. E., Ottawa, Ont.—

Topographical mapping for the revision of the Brandon sectional map comprising townships 9 to 16, ranges 5 to 19, west of the Principal meridian, and of a portion of the Dufferin sectional map comprising townships 1 to 8, ranges 10 to 19, west of the Principal meridian.

Pearson, H. E., Edmonton, Alta.—

Part subdivision of tps. 77 and 78-13-5; tp. 85-4-6; tp. 82-5-6; tps. 87 and 88-10-6. Stadia surveys in tp. 78-14-5.

SESSIONAL PAPER No. 25a

Pierce, J. W., Ottawa, Ont.—

Topographical mapping for the revision of the Red Deer sectional map, comprising townships 33 to 40 from range 15 west of the Fourth meridian, westerly to the Fifth meridian, and of the Peace Hills sectional map, comprising townships 41 to 48 from range 15 west of the Fourth meridian westerly to the Fifth meridian. Stadia surveys in tps. 42 and 44-21-4; tp. 43-22-4; tps. 41 and 43-23-4; tp. 44-27-4.

Purser, R. C., Ottawa, Ont.—

Resurvey of the 8th correction line across ranges 27, 28 and 29 west of the Fourth meridian and across range 1 west of the Fifth meridian. Retracement in tp. 31-1-5; tp. 52-4-5. Retracement and miscellaneous surveys in tp. 26-5-3; tp. 64-12-4. Renewal of monuments on part of east outline of tp. 48-1-6. Investigation of lakes in tp. 25-4-4; tp. 34-11-4. Survey of coal areas in tps. 46 and 47-23-5.

Read, H. E., Calgary, Alta.—

Secondary levels along the 6th base line from the east boundary of range 13 west of the Second meridian to the east boundary of range 6, west of the Third meridian, thence north along the east boundary of township 21, thence west along the north boundary of township 21 to the east boundary of range 13, west of the Third meridian. Along the 7th base line across ranges 13 and 14 west of the Second meridian. Total—190 miles.

Rinfret, C., Ottawa, Ont.—

Stadia surveys in tps. 1 to 8-1-2; tps. 1 to 8-2-2; tps. 1 to 5, 7 and 8-3-2; tps. 1 to 8-4-2; tps. 1 to 6 and 11 to 13-5-2; tps. 1 to 6 and 12-6-2; tps. 1 to 6-7-2; tps. 1 to 6-8-2; tps. 1 to 6-9-2; tps. 1 to 6-10-2; tps. 1 to 6-11-2; tps. 1 to 6-12-2; tps. 1 to 6-13-2; tps. 1 to 6-14-2; tps. 1 to 6-15-2; tps. 1 to 6-16-2; tps. 1 to 6-17-2; tps. 1 to 6-18-2. Subdivision in tp. 3-13-2. Retracement in tp. 15-4-2; tp. 5-18-2.

Seibert, F. V., Edmonton, Alta.—

Supervision of survey parties in charge of R. H. Knight, D.L.S., and W. A. Fletcher, D.L.S., engaged on the clearing of land by controlled fires, and investigation of lands for future clearing in the Peace River district.

Stewart, N. C., Vancouver, B.C.—

Subdivision of tp. 74-1-6. Part subdivision in tp. 74-26-5; tps. 75 and 76-1-6; tp. 77-3-6. Survey of road diversions for highway across proposed Birch Hills forest reserve in tp. 77-3-6.

Taggart, C. H., Kamloops, B.C.—

Stadia surveys in tps. 50 and 53-7-3; tps. 44 to 46-12-3; tps. 41 to 46-13-3; tps. 41 to 45-14-3; tps. 41 to 45-15-3; tps. 41 to 45-16-3; tps. 41 to 44-17-3; tps. 41 to 44-18-3; tps. 41 to 44-19-3; tps. 42 to 44-20-3. Retracement in tp. 43-16-3.

Vicars, J., Kamloops, B.C.—

Subdivision surveys in tps. 22 and 23-8-6; tps. 22 and 23-9-6; tp. 22-10-6; tp. 22-11-6; tps. 16 and 21-14-6; tp. 21-15-6; tp. 17-18-6; tps. 17, 21 and 22-19-6; tp. 17-20-6. Stadia surveys in tp. 22-18-6. Delimitation of the south limit of the railway belt in tp. 17-18-6; tp. 17-19-6; tp. 17-20-6.

Walker, C. M., Banff, Alta.—

Stadia surveys in tp. 55-1-4; tps. 54 to 56-2-4; tps. 54 to 56-3-4; tps. 54 to 58 and 63-4-4; tps. 53 to 58 and 63-5-4; tps. 54 to 57-6-4; tps. 54 to 58-7-4; tps. 53 to 57-8-4; tps. 53 to 59-9-4; tps. 53 and 54-10-4; tps. 61 and 63-11-4. Retracement in tp. 58-9-4.

Waugh, B. W., Ottawa, Ont.—

Survey of the 18th base line across ranges 17 to 29 west of the Principal meridian and ranges 1 and 2 west of the Second meridian. Exploratory survey for mapping purposes of the country adjacent to the portion of the 18th base line surveyed.

APPENDIX No. 3

SCHEDULE showing for each surveyor employed the number of miles surveyed of section lines, township outlines, traverses of lakes and rivers, and resurvey; also the cost of the same. Surveyors whose work cannot be reckoned in miles are omitted from the statement.

Surveyor	Miles of Section	Miles of Outline	Miles of Traverse	Miles of Resurvey	Total Mileage	Total Cost	Cost per mile
						\$ cts.	\$ cts.
Bennett, G. A	12		338	..	350	8,806 76	25 16
Blanchet, G. H.	130	41	41	19	231	15,739 42	68 13
Bowman, E. P..			1,166	..	1,166	10,432 96	8 95
Christie, W.....			359	..	359	7,723 52	21 51
Cowper, G. C....			331	..	331	8,830 54	26 68
Cumming, A. L....				227	227	14,040 78	61 85
*Davies, T. A....			136	..	136	5,425 99	39 90
Fawcett, S. D..			70	..	70	9,800 08	140 00
Fletcher, W. A....			307	36	343	5,814 82	16 95
Fontaine, L. E....	164	31	21		216	20,619 21	95 46
Glover, A. E.....	189	44	87		320	15,003 00	46 88
Hardouin, J.....	174	21	60	10	265	18,108 91	68 33
Hotchkiss, C. P.	145	36	44	..	225	20,819 34	92 53
Knight, R. H.....	185	39	24	2	250	15,362 70	61 45
LeBlanc, P. M. H.			706	6	712	7,341 30	10 31
*Melhuish, P.....			126	..	126	4,494 93	35 68
McGarry, P. J..	10		608	3	621	9,442 15	15 20
McKay, R. B....				245	245	10,477 93	42 77
Norrish, W. H . .	147	35	10	..	192	16,955 88	88 31
Pearson, H. E.....	170	15	14	..	199	17,180 10	86 33
Rinfret, C.....			243	17	260	8,395 78	32 29
Stewart, N. C..	135	15	11	..	161	17,423 05	108 22
Taggart, C. H....			306	3	309	5,827 28	18 86
Walker, C. M.....			550	2	552	8,234 43	14 92
Waugh, B. W.		103		..	103	25,387 06	246 48
	1,461	380	5,558	570	7,969	307,687 92	38 61

* Employed in field part time only.
Total cost includes depreciation of outfit.

SESSIONAL PAPER No. 25a

APPENDIX No. 4

DETAILS OF OFFICE WORK

Sketches, maps, and tracings..	4,884
Descriptions of irregular parcels of land..	10
Pages of field notes copied..	932
Returns of survey examined—	
Township subdivision..	84
Townships investigated for water areas..	516
Stadia plots..	517
Road plans..	763
Railway plans..	106
Mineral claim plans..	310
Correction and other miscellaneous surveys..	65
Preliminary township plans issued..	73
Township and miscellaneous plans compiled..	348
Township and miscellaneous plans issued..	262
Township land classification plans prepared..	621
Sectional maps issued (three miles to one inch)—	
New maps..	1
Revised maps..	5
Photographic work—	
Dry plates and films..	1,434
Contact prints..	8,323
Vandyke prints and blueprints..	1,823
Bromide enlargements..	1,700
Prints mounted..	3,245
Lantern slides..	50
Wet plate process negatives..	1,722
Photo-litho plates..	702

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APPENDIX No. 5

SURVEYING INSTRUMENTS on Hand March 31, 1921, including Laboratory Equipment as Instruments in Store.

Instruments	In Stock April 1, 1920	Purchased	Balance			Remarks
			Sold	Loan	Store	
Abney levels.....	21	1	5	1	16	
Alidades.....	1				1	
Alt-azimuths.....	1				1	
Aneroids.....	108	54		2	155	4 worn out; 1 lost on survey.
Artificial horizons.....	4				4	
Base line apparatus.....	1				1	
Cameras and kodaks.....	24			7	16	1 lost on survey.
Chronometers and sidereal watches...	55	1	7		49	
Compasses.....	71	20		5	84	2 lost on survey.
Current meters and logs.....	3				3	
Dip circles.....	2				2	
Field glasses and binoculars.....	6			1	5	
Levels.....	53	1		10	44	
Leveling rods.....	87			17	70	
Micrometer telescopes.....	8				8	
Optical squares.....	1				1	
Odometers.....	5				5	
Pedometers.....	16				16	
Photo-theodolites.....	5				5	
Plane tables.....	1				1	
Protractors.....	70		1	25	41	2 lost on survey; 1 worn out.
Rod levels.....	29			1	28	
Sextants and reflecting circles.....	3				3	
Solar compasses.....	2				2	
Stadia rods.....	42	1	6		36	1 worn out.
Stadia slide rules.....	60		1	3	54	2 destroyed by fire
Steel tapes.....	132		16	4	112	
Subsidiary standard measures.....	60	13	41		32	
Survey pickets.....	2				2	
Surveying cameras.....	4				4	
Tally registers.....	51	42		6	85	1 lost on survey; 1 worn out.
Thermometers.....	29	30	8	3	48	
Transit theodolites.....	60	16	8	4	64	
Zenith telescopes.....	1				1	

INDEX TO TOWNSHIP

of the Interior, 1850-51



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INDEX TO TOWNSHIPS IN MANITOBA, SASKATCHEWAN, ALBERTA, AND BRITISH COLUMBIA

Annual report of the Topographical Survey Branch, Department of the Interior, 1920-21

To illustrate Progress of Dominion Lands Surveys

Scale, 1 inch to 55 miles



CAUTION: This is only an index, topographical and other features are not to be depended upon.

Surveys in the Railway Belt in British Columbia are not shown owing to their scattered nature.
Lines of split levels run prior to March 31, 1921.
Base and meridian lines in unsurveyed territory run prior to March 31, 1921.
Townships wholly or partly surveyed are not shown.